THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, FEBRUARY 19, 1864. [No. 587. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

FEB. 24.—"On Petroleum, its Economic Value, and a Visit to the Petroleum Wells of Canada." By DR. MARCET, F.R.S.

MARCH 2.—"On the Verification of Olive Oil, by means of its Cohesion Figure." By CHARLES TOMLINSON, Esq., Lecturer on Science at King's College School.

MARCH 9.—"The Science of Fish-hatching." By Frank Buckland, Esq., M.A., F.Z.S., late 2nd Life Guards.

CANTOR LECTURES.

Courses of Lectures on the following subjects are arranged for the present Session :—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. HASTINGS, Esq., Barrister-at-Law (already delivered).

Fine Arts Applied to Industry. By W. BURGES, Esq.

Chemistry Applied to the Arts. By Dr. F. CRACE CALVERT, F.R.S.

The third lecture of Mr. Burges's course will be delivered on Monday next, the 22nd inst. :—

FEB. 22.—LECTURE III.—*Pottery.*—Etruscan vases (Wedgwood); Italian majolica (Minton); Sèvres china; modern biscuit.

FEB. 29.—LECTURE IV.—*Iron and Brass.*—Antique bronzes; Mediæval ditto; modern French bronzes (Barbédienne); Mediæval dinanderie; modern ditto (Hardman, Hart, &c.); Mediæval and Renaissance wrought iron; modern ditto; cast iron.

MAR. 7.—LECTURE V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

MAR. 14.—LECTURE VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

The Lectures will begin on each evening at 8 o'clock.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement :—

Banbury Science School.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ.

SECOND LECTURE, MONDAY, FEB. 15.—GLASS.

Mr. BURGES, after explaining the true uses of antiquarian study, proceeded to give a description of antique glass. It appears that, so far from the old Greeks and Romans being ignorant of this material, they made vases in great quantities, which quite equal if not surpass what we produce in the present day. Thus, vases are found which are decorated with filagree ornaments, the crackle, gilding, stamping, &c., indeed, with every process which we are accustomed to consider the peculiar invention of the Venetians. The manufactures of these latter people were then described, beginning with the older examples, now so rare, and which sell at such marvellous prices. The date of these must be placed at the latter end of the 15th century, and they are, for the most part, blue and green, decorated with enamelled figures, and imitation jewels and gilding, applied in the most artistic manner. The other sorts of glass, more particularly the filagree and what is called the schmelz, were referred to and illustrated by specimens of the actual old work, for the most part kindly lent by Mr. John Webb. Modern glass manufacture was represented by some excellent examples from the manufactory of Messrs. Powell, Whitefriars. The next application of art to glass, touched upon by the lecturer, was its employment for stained glass windows. He first of all defined the various methods in which the mediæval workmen arranged their subjects, such as medallion, figure, and grisaille windows; and then, in order to show why it is so commonly asserted that the modern windows are not equal to the old, went into a history of the numerous improvements of the modern stained glass, principally brought about by the exertions of Mr. C. Winston. The third part of the lecture referred to glass mosaic and its modern revival. Attention was drawn more especially to the difficulty generally found in preparing the gold, which is placed between two thicknesses of glass, the lower one having $\frac{1}{4}$ of an inch in thickness, while the upper one is as thin as a hair. Dr. Salviati, however, appeared to have perfectly succeeded, his specimens, more especially those stamped into ornaments, obtaining a great deal of admiration. Mr. Burges concluded with a few words on enamelling, also a branch of glass making, but which, at present, appears to be but little employed except for watch faces and jewellery, although anciently a large trade was carried on in it at Limoges, to say nothing of the immense quantities produced in China during the two last centuries. Attention was called to the modern productions of Mr. Legoste, in which, by means of casting the

metal into the required cavities, instead of scooping them out, he is enabled to sell his works at a very reasonable rate. The table and walls of the room were covered with choice specimens of ancient Venetian and mediæval glass, besides some beautiful mosaics of Dr. Salviati and Mr. Fisher, and some excellent cartoons of stained glass, by Messrs. E. B. Jones and Holliday. The Society have also to thank Mr. Eastwood for the examples of ancient glass, Mr. John Webb, for the Venetian, and Mr. Wareham for an excellent collection of Chinese enamels; and some charming cartoons for stained glass were furnished through the kindness of Messrs. Lavers and Barraud, and Messrs. Powell, the latter having also supplied a fine collection of modern glass, suitable for every-day use.

TENTH ORDINARY MEETING.

Wednesday, February 17th, 1864; Edwin Chadwick, Esq., C.B., in the chair.

The following candidates were proposed for election as members of the Society:—

Blackburn, Henry, 27, Victoria-street, S.W.
Smith, S. Pountney, The Limes, Shrewsbury.
Steele, Edwin Breare, Vauxhall-cottage, Parkhall-lane, Leeds.

The following candidates were balloted for and duly elected members of the Society:—

Bevan, Alfred, 11, Bryanston-square, W.
Bird, Thomas, 106, King-street, Manchester.
Busk, William, 28, Bessborough-gardens, Pimlico, S.W.
Greig, Robert R., 4, Verulam-buildings, Gray's-inn, W.C.
Henchy, Capt. Robert Cameron, Junior United Service Club, S.W.
Nunn, Richard M., Grays, Essex.

The Paper read was—

ON PRIVATE AND PUBLIC DIETARIES.

BY EDWARD SMITH, M.D., F.R.S, F.R.C.P., ASSISTANT-PHYSICIAN TO THE HOSPITAL FOR CONSUMPTION, BROMPTON, &c.

INTRODUCTORY.

The amount of nourishment which a people obtains must exert a large influence over the national character. An ill-fed nation can scarcely be a healthy one, and certainly it will be deficient in bodily strength and enterprise, whilst a sufficiently fed people, having these characteristics in a high degree, will be able to acquire wealth, which may be regarded as the material foundation for the stability of an empire and for influence among nations. Here I regard the sufficiency of food acting upon the masses of a population as the cause, not the consequence, of national greatness, but in the diffusion of the blessings which flow from wealth it may be expected that the consequence may in its turn react as a cause.

We have the happiness to be citizens of a country which equals, if it do not excel, any nation of ancient or modern times in the health and longevity of its people, the distribution of bodily vigour and mental energy, and the advantages of wealth with its attendant intelligence, comfort, and influence; and I have reason to believe that to this may be added the fundamental cause—the general abundance of food among the people. Yet it does not follow that these conditions have attained to their highest development, any more than that from them could be inferred the state of any section of the community or of any individual in a section. There is still doubtless need for progress in reference to the masses which constitute the nation, as there are, and always will be, multitudes who, in their individual relation, add little to the national wealth, and need the aid of others to procure the means whereby their own existence may be prolonged.

In the paper which I have now the honour to read to you, I hope to include both those who are sufficiently and those who are insufficiently fed—those who add to the wealth of, and those who are a burden to, society; and to show how the means of the one may be increased, and how the burden of the other may be lessened.

The principles which will guide me are to show in what way the largest amount of nutriment can be gained by those who have money to spend in private dietaries, and upon how little cost those may be supported who are fed by public dietaries.

The communication which I made to this Society two months ago, may be regarded as an introduction to the present one, since it gave the means of ascertaining the relation of the nutriment contained in various foods to a given cost, and it remains now to group together the cheaper foods in such a manner as will maintain health and meet the tastes of the people.

It was shown that the only practicable method of dealing with foods in relation to their nutritive value in a given dietary, is to ascertain the carbon and nitrogen contained in them, and estimate the cost of these elements at the market-price of the food. In reference to carbon, the cheapest foods were stated to be maize (or Indian corn), barley meal, rye meal, butter milk, peas, fresh vegetables (under certain conditions), oatmeal, bones, wheaten flour, and rice. As to nitrogen, the cheapest foods were butter milk, skimmed milk, peas, skimmed-milk cheese, maize, barley and rye meal, oatmeal, liver, fresh herrings, wheaten flour, fresh vegetables when cheap, dried herrings and bones. Maize, barley and rye, butter milk, peas, fresh vegetables when cheap, oatmeal, wheaten flour, and bones appear in both lists, and are therefore the cheapest foods.

On the other hand the following foods are the dearest in reference to carbon:—Tea, beef, new milk cheese, butter, dried herrings, mutton, skimmed milk (when dear), pork, fresh herrings, and new milk, and in reference to nitrogen:—Tea, dried bacon, green bacon, pork, mutton, new milk (when dear), beef, and potatoes (when dear). Tea, beef, mutton, pork, and new milk (when dear) appear in both lists.

The general result is to show that farinaceous foods and bones are the cheapest, whilst meats are the dearest; that milk and cheese occupy one or other list according to the cost of the different kinds, and that sugar and fats occupy a middle place.

When the hydrogen is calculated and reckoned as carbon the relative positions of some of the foods are slightly altered, but the extent of the change may be seen on reference to the column which I have added to the table which was printed in my paper on December 16, 1863.

PRIVATE DIETARIES.

In proceeding to consider the private dietaries of the working classes, we must distinctly recognise the fact that some persons can only afford such foods as will maintain life, whilst others are able not only to do this, but consistently with it to please their appetites and select a larger proportion of the higher priced and luxurious foods. I am very desirous that this division should be borne in mind, for it is manifestly the first duty of a man to provide his family with sufficiency of nourishment, and, if necessary to do this, he should restrict them to dry bread, rather than limit the quantity of the bread by spending some portion of his money upon more costly foods. Inattention to this principle is, in fact, the radical source of error in the dietary of our lowest fed people, since they seek to obtain varied and sapid foods at the cost of insufficient quantity, and thus fall into disease; and it is to this class that the information which I desire to give is especially fitted.

This raises the question of the lowest amount and cost of food which is compatible with prolonged life and moderate health. It is a problem of complexity, both from the varying requirements of age, sex, and labour, and from the difference in the cost of foods in different

localities, but we may make an estimate which shall not be far from the truth in reference to the majority of cases. When desired by the Government to answer this question in reference to the Lancashire operatives, I stated that the quantity of carbon and nitrogen required daily by a man in middle life, in good health, and making a moderate amount of exertion (viz., exercise equivalent to standing 2½ hours, walking at the rate of two miles per hour during three hours, and at the rate of three miles per hour during one hour), was 4,300 grains of the former and 200 grains of the latter; and this I derived from numerous experiments, of which my own were by far the most extensive, showing the amount of these substances which are emitted from the body. We have no data so accurate and extensive with regard to women, but I was of opinion, from a consideration of all the known facts, that the diminution should not exceed 1-10th. This would give an average weekly requirement of 30,100 grains of carbon and 1,400 grains of nitrogen for men, 27,100 grains of carbon and 1,260 grains of nitrogen for women; and, when an average of equal numbers of both sexes was taken, 28,600 grains of carbon and 1,330 grains of nitrogen; and whilst I think this a sufficient quantity under the conditions named, it ought not to be reduced. The cost at which this could be furnished at the prices in the north of England, was 2s. for women and 2s. 4d. for men, but in order to err on the safe side, if err at all, and to meet the extra cost of foods in other parts of the country, I advised that the minimum allowance for food for the two sexes should be 2s. 3d. and 2s. 6d. respectively. When the dietary is intended for a family of different ages, the estimate must be of a more general character, and the nearest approach which I could make was to answer that a child over 12 years of age would eat as much as a woman, and that 2s. a week should be allowed for it, whilst under that age an average of 1s. 6d. per week would doubtless suffice to cover the cost of food.

This, then, is the basis which may be safely adopted both in public and private dietaries, with the exception of the cases in which the man makes more exertion than occurs in an ordinary trade, or where one member of the family is ill, and can only take the higher-priced foods.

I am precluded from quoting experience to support these estimates, but I may state that the information which will probably be published by the government in a few months will greatly add to our present knowledge. In reference to the operatives of Lancashire, I find that their average daily dietary during the existing depression, included 4,588 grains of carbon and 215 grains of nitrogen for men, and 3,758 grains of carbon and 155 grains of nitrogen for women, which, with an equal number of the two sexes, gave 4,173 grains of carbon and 185 grains of nitrogen. This is a little higher in carbon and lower in nitrogen than my estimate, and upon it we have abundant evidence that the health of this class of persons has not only been maintained but evidently improved.

Let us now see in what way the required nutriment may be produced at the price named. First, I will quote, from the tables issued by the government, the dietary of a few persons, to show how far their own experience has enabled them to do this.

No. 1. Male.—Carbon, 4,787 grains; nitrogen, 132 grains daily; cost 1s. 11½d. weekly. Bread, 10lbs.; sugar, 1lb.; butter, ¼lb.; and coffee, 2oz.; so that he lived on bread and butter and coffee.

No. 2. Male.—Carbon, 4,528 grains; nitrogen, 165 grains daily; cost 2s. 2d. weekly. Bread, 8lbs.; onions, 2lbs.; treacle, 1lb.; bacon, ½lb.; cheese, ½lb.; tea, ½oz. He ate bread and treacle, bread and bacon, bread and onions, bread and cheese, and tea without milk or sugar.

No. 3. Female.—Carbon, 3,801 grains; nitrogen, 164 grains daily; cost 1s. 9d. weekly, and out of 2s. allowed for food, saved 3d. weekly to redeem her clothes. Bread, 12lbs.; treacle, ½lb.; bacon, ¼lb.; 3 herrings, and coffee, 1oz. She obtained bacon or herring five days per week, with much bread, and coffee sweetened with treacle, and was well nourished.

No. 4. Female.—Carbon, 3,011 grains; nitrogen, 109 grains daily; cost 1s. 11½d. weekly. Bread, 8lbs.; sugar, ½lb.; treacle, 1½lb.; bacon, 2 oz.; tea, 1 oz.; and coffee, 1oz. She lived on bread and treacle, tea and coffee, and bacon only on Sunday, and was ill nourished.

Case No. 5. Female.—Carbon, 3,777 grains; nitrogen, 165 grains daily; cost, 2s. 0½d. weekly. Bread, 8lbs.; oatmeal, 1½lb.; treacle, 1lb.; bacon, ½lb.; meat, ½lb.; skimmed milk, 2 pints; and coffee, 1oz. She had meat or bacon daily, oatmeal porridge and treacle, or stirabout with treacle, bread and coffee sweetened with treacle. This was the best arrangement of food which I met with, and she was abundantly nourished.

Case No. 6. Female.—Carbon, 2,832 grains; nitrogen, 117 grains daily; cost, 1s. 10d. weekly. Bread, 8lbs.; sugar, ½lb.; treacle, 1lb.; bacon, ¼lb.; 1 herring; and tea, 2oz. This was an ill-arranged dietary, and she was ill-nourished.

Case No. 7. Female.—Carbon, 3,597 grains; nitrogen, 129 grains daily; cost, 2s. weekly. Bread, 8lbs.; potatoes, 5lbs.; sugar, ½lb.; treacle, ½lb.; butter, ¼lb.; bacon, ½lb.; and coffee, 2oz. She ate bacon three times a week, with potatoes, and bread and butter with tea and coffee, but was not well nourished.

Case No. 8. Female.—Carbon, 5,008 grains; nitrogen, 156 grains daily; cost, 2s. 2d. weekly. Bread, 8lbs.; oatmeal, ½lb.; treacle, 1½lb.; skimmed milk, 3 pints; tea, 1oz.; and coffee, 2oz. She ate milk porridge, oatmeal pudding with treacle, bread and treacle, and tea and coffee, and obtained an abundance of carbon, but a deficiency of nitrogen.

Case No. 9. Female.—Carbon, 2,963 grains; nitrogen, 164 grains daily; cost, 2s. weekly. Bread, 6lbs.; oatmeal, 1lb.; sugar, ¼lb.; bacon, ¼lb.; 4 herrings; buttermilk, 6 pints; and tea, 1oz. She obtained herrings or bacon five times a week, and buttermilk with oatmeal and bread daily, but owing to the small quantity of farinaceous food her dietary was deficient in carbon.

Case No. 10. Female.—Carbon, 3,351 grains; nitrogen, 136 grains daily; cost, 1s. 10d. weekly. Bread, 8lbs; oatmeal, 1½lbs.; sugar, ½lb.; treacle, ½lb.; butter, ½lb.; and tea, ½oz. She lived on bread and butter and bread and treacle with tea, and oatmeal pudding with treacle, and had a dietary very deficient in nitrogen.

Case No. 11. Female.—Carbon, 3,405 grains; nitrogen, 129 grains daily; cost, 1s. 7½d. weekly. Bread, 6lbs.; oatmeal, 2½lbs.; sugar, ¼lb.; treacle, 1½lb.; butter, ½lb.; and coffee, 1oz. She lived on bread and butter, oatmeal pudding and treacle, and coffee sweetened with treacle, and her diet was deficient in nitrogen.

The most economical dietary was that of case No. 3, at a cost of 3d. per day, and the selection made by case 5, at a cost of 3½d. per day, might be said to be luxurious; yet it is to be remarked that there was but little relation between the nutriment and the cost in the different dietaries, and in none was the quantity of nitrogen obtained equal to the standard.

In drawing up model dietaries I have endeavoured to obviate the defects now mentioned, and to meet the requirements of the system:—

1. By providing sufficient nourishment.
2. By selecting well-known foods.
3. By giving such variety as would permit the meals to be varied, and to correspond with that of the community, and particularly, whilst not permitting a deficiency of nourishment, to introduce almost daily some kind of meat for dinner.
4. By introducing fresh vegetables at a cost of 2d. per week.

The following are selected from those which cost from less than 3½d. to less than 4½d. per day, at the prices in the North of England:—

No. 1. Carbon, 4,004 grains; nitrogen, 201 grains daily; cost, 1s. 11¾d. weekly:—Bread, 9lbs.; oatmeal, 1lb.;

meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; butter-milk 3 pints; and vegetables 4lbs. This would give milk-porridge twice a day, with bread and vegetables daily and meat five times a week.

No. 2. Carbon, 4,122 grains; nitrogen, 207 grains daily; cost, 2s. weekly:—Bread, 8lb.; oatmeal, 1½lb.; treacle, ½lb.; bacon, ½lb.; 3 herrings; skimmed milk, 7 pints; and vegetables 4lbs.—This would give animal food and vegetables daily, with milk-porridge and oatmeal, pudding, and bread and treacle.

No. 3. Carbon, 4,249 grains; nitrogen, 184 grains daily; cost, 2s. 0½d. weekly:—Bread, 8lbs.; oatmeal, 2lbs.; sugar, ½lb.; treacle 1 lb.; meat ½lb.; skimmed milk, 7 pints; coffee, 2oz.; vegetables, 2lbs. This gives bread and treacle, oatmeal pudding and treacle, milk porridge, meat four times a week, and coffee daily, but by introducing more sugar and the coffee the proportionate amount of nitrogen is lessened.

No. 4. Carbon, 3,701 grains; nitrogen, 165 grains daily; cost, 2s. 1d. weekly:—Bread, 8lbs.; flour, ½lb.; sugar, ½lb.; dripping, 2oz.; meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; coffee, 2oz.; and vegetables, 4lbs. This will give meat and vegetables daily, with one or two plain puddings, bread and dripping, bread and milk, and coffee.

No. 5. Carbon, 3,937 grains; nitrogen, 208 grains daily; cost, 2s. 2d. weekly:—Bread 8lbs.; flour, 1 lb.; oatmeal, 1 lb.; sugar, ½lb.; dripping, 2oz.; suet, 2oz.; 3 herrings; liver, ½lb.; skimmed milk, 3½ pints; cheese, ½lb.; coffee, 2oz.; and vegetables, 2lbs. This would give three or four plain puddings with fat and milk, animal food four days, and cheese two days weekly, with vegetables daily, milk porridge, bread and coffee.

No. 6. Carbon, 4,793 grains; nitrogen, 200 grains daily; cost, 2s. 3½d. weekly:—Bread, 10lbs.; oatmeal, 1lb.; rice, 1lb.; sugar, ½lb.; treacle, ½lb.; dripping, ½lb.; skimmed milk, 3 pints; butter-milk, 4 pints; coffee, 2oz.; and vegetables, 4lbs. This excludes meat, but supplies much bread, with dripping or treacle, boiled rice or rice-pudding, with milk, vegetables, and dripping, milk-porridge and coffee. It is deficient in the comfort of the dinner, but the whole nourishment is ample.

No. 7. Carbon, 4,433 grains; nitrogen, 198 grains daily; cost, 2s. 4d. weekly:—Bread, 10lbs.; oatmeal, 1lb.; treacle, ½lb.; butter, ½lb.; meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; and vegetables, 3½lbs. This gives no coffee, much bread, with butter or treacle, oatmeal pudding with treacle, milk porridge, and meat five days weekly, with vegetables daily.

No. 8. Carbon, 4,991; nitrogen, 221 grains daily; cost, 2s. 4½d. weekly. Bread, 10lbs.; oatmeal, 2lbs.; treacle, ½lb.; meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; and vegetables, 4lbs. This is an excessive dietary, and differs from the last only in supplying meat daily, and offering more oatmeal pudding.

No. 9. Carbon, 4,434 grains; nitrogen, 210 grains daily: cost, 2s. 4½d. weekly. Bread, 8lbs.; oatmeal, 2lbs.; sugar, ½lb.; treacle, 1lb.; skimmed milk, 3½ pints; buttermilk, 3 pints; coffee, 2oz.; bacon, 1lb.; and vegetables, 4lb. This would give bacon, vegetables, and bread daily, with oatmeal pudding and treacle, milk porridge, and coffee.

No. 10. Carbon, 4,714 grains; nitrogen, 265 grains daily; cost, 2s. 6d. weekly. Bread, 8lbs.; oatmeal, 2lbs.; peas, 1 pint; sugar, ½lb.; treacle, ½lb.; butter, 2oz.; 4 herrings; bacon, ½lb.; liver, ½lb.; skimmed milk, 6 pints; coffee, 1 oz.; and vegetables, 2lbs. This is an excessive dietary, and particularly in nitrogen. It supplies animal food six or seven days in the form of liver and bacon, with boiled peas pudding, or herring, and vegetables, oatmeal pudding, with treacle, milk porridge, coffee, bread and butter, and treacle.

Such are examples of how much nutriment may be obtained from food to which the people are accustomed, and offering three meals a day with the usual variety, and usually including 2oz. of some kind of meat, at a cost up to 4¼d. per day. The articles selected are the cheapest farinaceous foods, American bacon, which is the cheapest fat, and skimmed milk, whilst sparing use has been made of butchers' meat, sugars, and the dearer fats.

Let us now look at the subject in another, and to my mind more satisfactory light, and ascertain how much nutriment can be afforded at a meal for sums not exceeding 1½d. for breakfast, 2d. for dinner, and 1d. for tea or supper, or a total cost not exceeding 4½d. per day. For this purpose I will again turn to the dietaries which I have prepared for the Government, and in order to apportion the daily nutriment to the wants of the system at the period of the three meals, I will state that the amount of carbon required is 1,500 grains at breakfast, 1,800 grains at dinner, and 1,000 grains at supper, whilst that of nitrogen required at those meals is 70 grains, 90 grains, and 40 grains, respectively.

BREAKFAST.

No 1.—Oatmeal brose. Carbon, 1,397 grains; nitrogen, 74 grains; cost, 1d. Oatmeal, 6oz.; treacle, 1oz.; skimmed milk, ½ pint; water, ¼ pint.

No. 2.—Milk porridge. Carbon, 1,300 grains; nitrogen, 77 grains; cost, 1½d. Skimmed milk, 1 pint; oatmeal, 2oz.; bread, 3oz.; fat, ½oz.

No. 3.—Milk porridge. Carbon, 1,478 grains; nitrogen, 80 grains; cost 1¼d. Skimmed milk, ¾ pint; oatmeal, 2 oz.; bread, 5⅓ oz.; fat, ½ oz.; water, ¼ pint.

No. 4.—Milk porridge and bacon. Carbon, 1,564 grains; nitrogen, 69 grains; cost, 1¼d. Skimmed milk, ½ pint; oatmeal, 1½ oz.; water, ½ pint; bread, 4 oz.; bacon, 2 oz.

No. 5.—Rice, milk, and bread. Carbon, 1,551 grains; nitrogen, 75 grains; cost, 1¼d. Rice, 2 oz.; skimmed milk, 1 pint; treacle, 1 oz.; spice; fat, ½ oz.; bread, 4 oz.

No. 6.—Coffee, bread, and butter. Carbon, 1,190 grains; nitrogen, 56 grains; cost, 1¼d. Coffee and chickory, ⅛ oz.; skimmed milk, ½ pint; sugar, ½ oz.; water, ½ pint; bread, 6 oz.; butter, ½ oz.

No. 7.—Coffee, bread, and bacon.—Carbon, 1,528 grains; nitrogen, 58 grains; cost, 1⅜d. Coffee, ⅛ oz.; skimmed milk, ¼ pint; sugar, ½ oz.; water, ½ pint; bread, 6 oz.; bacon, 2 oz.

No. 8.—Oatmeal brose, bread and bacon. Carbon, 1,990 grains; nitrogen, 88 grains; cost, 1½d. Oatmeal, 5 oz.; treacle, 1 oz.; skimmed milk, ½ pint; water, ¼ pint; bread, 3 oz.; bacon, 1 oz.

No. 9.—Rice milk, bread, and bacon.—Carbon, 1,889 grains; nitrogen, 76 grains; cost, 1½d. Rice, 2 oz.; Skimmed milk, ¾ pint; treacle, 1 oz.; water, ⅛ pint; bread, 4 oz.; bacon, 2 oz.

No. 10.—Tea, bread, and butter. Carbon, 1,081 grains; nitrogen, 46 grains; cost, 1½d. Tea, ⅛ oz.; sugar, ½ oz.; skimmed milk, ¼ pint; water, ½ pint; bread, 6 oz.; butter, ½ oz.

Nos. 8 and 9 show, in a striking manner, the amount of nutriment which can be obtained from the cheaper farinaceous foods, cheap milk and cheap fat, whilst the contrast between them and Nos. 6 and 10 show how wasteful is the expenditure upon the dietary when tea and coffee are introduced. With the two last-mentioned exceptions the quantity of nitrogen is universally sufficient.

DINNER.

No. 1.—Bread and cheese. Carbon, 1,150 grains; nitrogen, 66 grains; cost, 1½d. Bread, 8 oz.; cheese, 1 oz.

No. 2.—Suet pudding, bread, and cheese. Carbon, 1,496 grains; nitrogen, 74 grains; cost, 1½d. Flour, 4 oz.; Suet, ½ oz.; skimmed milk, ¼ pint; bread, 4 oz.; cheese, ½ oz.

No. 3.—Rice pudding, bread, and cheese. Carbon, 1,673 grains; nitrogen, 83 grains; cost, 1½d. Rice, 3 oz.; skimmed milk, 1 pint; suet, ½ oz.; sugar, ¾ oz.; spice and salt; bread, 3 oz.; cheese, ½ oz.

No. 4.—Fish. Carbon, 1,387 grains; nitrogen, 101 grains; cost, 1¾d. Fresh herrings, 9 oz. (2); dripping, ½ oz.; potatoes, 8 oz.; bread, 3 oz.

No. 5.—Bacon, vegetables, and cheese. Carbon, 1,843

grains; nitrogen, 69 grains; cost, 1¼d. Bacon, 4 oz.; potatoes, 8 oz.; bread, 4 oz.; cheese, ½ oz.

6.—Meat, pudding, and bread. Carbon, 1,616 grains; nitrogen, 71 grains; cost, 2d. Flour, 4 oz.; suet, ¾ oz.; meat, 3 oz.; bread, 2 oz.; potatoes, 5 oz.

7.—Liver, pudding, and bread. Carbon, 1,734 grains; nitrogen, 100 grains; cost, 2d. Flour, 4 oz.; suet, ¾ oz.; liver, 4 oz.; bacon, 1 oz.; bread, 2 oz., or potatoes, 5 oz.

8.—Potatoe pie. Carbon, 1,778 grains; nitrogen, 71 grains, cost, 2d. Flour, 3 oz.; dripping, ¾ oz.; meat, 2½ oz., or potatoes, 8 oz.; bread, 2 oz.

9.—Faggots, peas pudding, bread, and cheese. Carbon, 1,513 grains; nitrogen, 140 grains; cost, 2d. Liver, 3 oz.; bacon, 1 oz.; herbs and peas, 3 oz.; bread, 2 oz.; cheese, ½ oz.

10.—Meat, vegetables, bread, and cheese. Carbon, 1,441 grains; nitrogen, 75 grains; cost, 2d. Meat, 3 oz.; potatoes, 8 oz.; bread, 4 oz.; cheese, ½ oz.

11.—Irish-stew and bread. Carbon, 1,568 grains; nitrogen, 72 grains; cost, 2d. Meat, 3 oz.; potatoes, 12 oz.; onions, 1 oz.; bread, 4 oz.

12.—Hasty pudding, herring, and potatoes. Carbon, 2,144 grains; nitrogen, 119 grains; cost, 2d. Flour, 6 oz.; skimmed milk, ½ pint; water; treacle, 2 oz.; 1 herring; potatoes, ½ lb.

Two of these largely exceed the standard quantity in carbon, viz., Nos. 2 and 12; whilst four, viz., Nos. 2, 4, 9, and 12, exceed it in nitrogen. No. 1 is quite insufficient for a man, whilst No. 12 is much more than enough.

SUPPER.

1.—Oatmeal brose, as at breakfast.

2.—Milk porridge. Carbon, 1,034 grains; nitrogen, 61 grains; cost, 1d. Skimmed milk, ¾ pint; oatmeal, 2 oz.; bread, 2 oz.; fat, ⅜ oz.

3.—Bacon and bread. Carbon, 1,250; nitrogen, 43 grains; cost, 1d. Bacon, 2 oz.; bread, 5⅓ oz.

4.—Tea, bread, and butter. Carbon, 670 grains; nitrogen, 29 grains; cost, 1d. Tea, ⅛ oz.; sugar, ½ oz.; skimmed milk, ⅛ pint; water, ⅝ pint; bread, 4 oz.; butter, ¼ oz.

5.—Coffee, bread, and butter. Carbon, 925 grains; nitrogen, 42 grains; cost, 1d. Coffee, ⅛ oz.; sugar, ½ oz.; skimmed milk, ¼ pint; water, ⅝ pint; bread, 5⅓ oz.; butter, ¼ oz.

In each of the first three there is an excess of the standard requirement, whilst the fourth corroborates the fact already mentioned, of the impossibility of providing an economical dietary where tea and butter are introduced.

Such, then, are abundant and cheap dietaries for our working classes, at a cost within the reach of all in England who obtain regular employment, or who are not oppressed with a large family wholly dependent upon the head. There are, however, multitudes of persons both in England, in our Sister Island, and on the Continent, who from these and other causes do not obtain so much income as would enable them continually to purchase this quantity of food, and to such it is of the greatest moment that they should restrict themselves to the cheapest food, as Indian corn, pease, bread, buttermilk, and skimmed milk. I need not, in this second paper, refer at length to the nutriment to be obtained from these foods, but a reference to the table will show that two pounds of Indian meal made into stirabout will afford more than the required nutriment at a cost of 2d. per day, and it cannot be doubted that this, with 1 pint of buttermilk, costing ½d., or of skimmed milk, costing ¼d. to ½d., would, if the appetite for it did not fail, sufficiently nourish the system. Again, in the case of those who grow a large quantity of potatoes at a merely nominal cost, there can be no doubt that they may make them a principal article of food, and, taken in sufficient quantity with buttermilk or skimmed milk, would maintain health at a cost much below that of the dietaries which I have devised.

It is, perhaps, right that here I should refer to the economy in the food now afforded by that excellent invention of the day, the dining-rooms for the working classes; but since the labour, house rent, apparatus, and interest of money must be paid for, and since vegetables cannot be grown by them, it is clear that a profit must be made upon the food provided more than would equal the economy in cooking and the purchase of the goods at the wholesale price, and that the food supplied cannot be sold at so low a price as it might be produced at the labourer's home. The manifest advantage of these institutions is seen by comparing their food and charges with those of previously existing eating houses; they enable the working man to obtain good food at a cost within his means. They are not so fitted for the lowest fed as for the class who can afford to spend 4d. for dinner, since, as I have shown, meat is a costly food, and potatoes are not a cheap food; and I may add that the broth ordinarily contains but little nutriment. Thus, if we take the elements of an ordinary dinner of ½d. of bread, 1d. of potatoes, 2d. of meat, and 1d. of broth, we find the amount of carbon and nitrogen supplied is as follows:—

	Carbon. Grains.	Nitrogen. Grains.
Bread 4 oz.	500	22
Potatoes 12 oz.	577	22
Meat 2 oz., reckoned as 3⅓ oz., raw meat with bone	493	30
Soup, the meat liquor included in the meat	300	12
	1,870	86

which will give only 416 grains of carbon and 19 grains of nitrogen for 1d., whilst the foregoing dietaries yield from 700 to 1000 grains of carbon, and upwards of 50 grains of nitrogen for the same money. The profit upon the bread is 2½d. to 3d. the 4lb. loaf; upon the potatoes ½d. per ration; upon the meat 4d. per lb. of raw meat, and upon the broth nearly ⅚ths of a penny per ration, the cost of the meat liquor being reckoned in that of the meat.

I wish here also to make the shortest possible reference to the out-door relief provided throughout the country for the poor. The largest portion of this is given in bread, which is, no doubt, the proper course, but when meat is allowed it is most rarely that a useful part is selected. I have found that the usual supply is the scrag end of the neck, or the breast of mutton; the former, consisting chiefly of bone, and if it is to be profitable at all, there must be a taste for broth, and conveniencies for making it; the latter, containing more than half its weight of fat, which is almost universally rejected by the sick. Surely, in such a case, beef should be usually given, and the part selected should be the round, which consists of prime lean meat without bone, or, if mutton be preferred, no part could be so useful as a portion of the leg, at the part where that joint is usually cut in two by the butcher. I know that the present system is wasteful and inefficient.

PUBLIC DIETARIES.

On proceeding to consider public dietaries I do not purpose to enter into large detail, but rather to content myself with a statement of the general principles which should be a guide in the selection of the particular food and in the general construction of the scheme of daily dietary. Those who are largely acquainted with the present dietaries of our public bodies will think that to merely indicate principles will be of little avail, since it is in details that the excellence or otherwise of the scheme must be tested, but in truth, the real wants of a man differ but little in any of the circumstances to which these dietaries refer, and the vast diversity of detail which at present exists is not due to any necessity, but to the absence of general principles in the construction of the scheme, and the deficiency of knowledge as to the particular food selected. It is almost incredible that in a country with so much intelligence and intercourse, there should be between 600 and 700 poor-law dietaries, including 40 in London, all

of which differ from each other, and that of country and borough prisons in England and Wales, not more than one-half have a uniform dietary. Surely, it is carrying out our system of de-centralization too far when there is no common authority, established by law, which enforces uniformity in subjects of such wide importance, and in conditions which themselves are so nearly uniform. If the result of this discussion should be to draw the attention of our legislature to this patent evil it will have conferred a great boon upon the whole community.

1.—POOR LAW DIETARIES.

The only principle which is acknowledged at present in these dietaries is that the food provided shall not exceed in quantity and quality that of the ordinary dietary of the same class of persons when out of the workhouse; and with this I cordially agree. The only source of difference is in the fact that to this moment the ordinary diet of the people has not been properly ascertained, and hence each person and each board of guardians has formed an estimate from general observation, but, as I mentioned in my former paper, this information has now been obtained, both from town and country, and will probably be issued in a few months, and pending that I must be content to simply affirm the principle.

The other general principles to which I would refer are these:—

A.—There must be a proper apportionment of the food according to sex and age. This is a subject of much difficulty, since there are no scientific data which refer to each year of life; and the relative wants of a man and woman vary with the size and activity of their bodies, rather than simply with sex, so that even a scientific man can only make a near appreciation to the truth. At present the reduction in the dietary for a woman, from the normal dietary for men, varies from half to a quarter, and it is only until a boy reaches the age of sixteen that he is considered to need the dietary of the man, and in both, I think, the dietary allowed is much under the requirement. From a consideration of the products of nutrition which pass out of the body, I do not think that the average dietary for women ought to be less than nine-tenths of that for men, neither being employed at hard labour.

The importance of the apportionment to age is exceedingly great, for it is only during the period of youth that growth progresses, and for healthy and suitable growth there must be sufficient food, and hence if the latter be withheld the former is deficient, and from the finality of the period of growth the loss can never be regained. Hence it is of far greater consequence that there should be abundant food given to a youth than to an adult, since the former can never regain his loss, whilst the latter can tolerate, with comparative impunity, much variation from his proper nourishment. I have entered at length into this subject in my work on "Health and Disease, as Influenced by the Cyclical Changes in the Human System," which may be found in our library, and I shall now only state that, in my opinion, above twelve years of age the dietary allowed ought to be that of a man; from the age of ten to the age of twelve, that of a woman; and that below ten years and above one year of age, there ought to be three scales of dietary, embracing the ages from two to five, from five to eight, and from eight to ten, or, as is far more natural, the dietary under the age of ten should be unlimited in quantity.

B.—The food supplied should be, in nature and variety, similar to that which they will obtain in later life. While it is a fact of the highest interest that the body can adapt itself to a great variety of circumstances to which it had not been accustomed, there can be no doubt that the changes are attended by risks, and that there are those who suffer from or sink under them, and in a wide point of view are not desirable. Hence, I would train up the body of the child as it shall be nourished when it becomes a man. I need not particularise the foods with which all are familiar, but precise information on this point will soon be supplied. As to variety of food, there can be no doubt that, within limits, it tends to improve the relish for and assimilation of food, and hence to increase nutrition, whilst beyond those limits, as we see amongst the well-fed classes, it lessens the appetite and the quantity of food that is eaten. Our ordinary habits do not seek for much variety at the first and last meal of the day, whilst one unvarying food at dinner would soon become unacceptable. Yet, even in that there is less diversity than at first sight appears, since all the food may yet be wound up under the terms, meat, potatoes, pudding; and the only variation is the kind of meat, and the components of the puddings, and the mode of cooking them. The dinner, then, should be varied, so that the same kind of meat shall not be always supplied, and that some change of food, or mode of cooking shall occur daily.

C.—The last observation may be regarded as trite and unnecessary, since it is admitted in most dietaries to a limited extent, but the next one, viz., that with variety in food there shall be uniformity in nourishment, is much disregarded. Thus, to select one from many dietaries which have been sent to me for my opinion on their fitness. On four days a week children from the age of five to the age of nine, have for dinner 3½ oz. of cooked meat and 8 oz. of potatoes, which contain between 1,200 and 1,300 grains of carbon, and nearly 70 grains of nitrogen, whilst on two days 10 oz. of suet pudding is alone allowed, containing about the same quantity of carbon, but only two-thirds of the quantity of nitrogen; but as the digestibility of the two diets must be very different, the defect of the latter is doubtless much greater than the chemical constituents indicate. On one day in the week there is rice pudding, and if we add ½ pint of milk to each 1 lb., which is no doubt beyond the mark, it will yield less than 800 grains of carbon and 27 grains of nitrogen, or a defect of more than one-third of carbon and nearly two-thirds of nitrogen. I may also make use of the same dietary to show another defect in the selection of food in poor-law dietaries: 16 oz. of rice, potatoes, or other vegetables, are allowed indifferently at dinner, the amount of carbon in the rice being nearly four times as great as that in potatoes, and nearly seven times as great as that in other vegetables, whilst the proportion of nitrogen in potatoes and vegetables is only one-third and one-fifth of that in rice. Thus, whilst the alternation of foods is necessary, it is manifest that by the present system even good guessing at truth is not effected, and that such recondite questions as the nutritive value of foods can only be answered by scientific authority.

D.—True economy consists in keeping the poor in health and strength at the least cost, and not simply in finding the cheapest dietary upon which they may live. Hence, 1st, a selection from the foods to which they are accustomed, of such as will yield the greatest nutriment at the least cost; 2nd, the cooking of them so as to obtain the whole of the nutriment from them; 3rd, by supply of proper kinds of foods with sufficient variety of flavour; by well-ventilated rooms and by exercise in the open air to keep up the relish for foods, for under such circumstances the food is better assimilated by the system (that is to say, less of it is wasted), and the cheaper and less savoury foods are with equal chemical value equally nutritive with others of a more costly kind.

E.—Of separate foods, I will refer to only two or three. For all persons below adult age, skimmed milk or butter milk, oatmeal, and bread should be given twice a day. The mid-day meal should always consist of meat and vegetables. The meat may be prepared as soup thrice a week with advantage, and to it should be added well-digested bones, pearl barley, and other vegetables, according to some of the numerous formulæ published by the Government, and of which the following three have been specially arranged by me:—

SOUPS.

OX-HEAD SOUP.	PEA SOUP.	PEA SOUP.
Cost per ration ·92d.	Cost per ration 1·28d.	Cost per ration 1·16d.
Carbon ..... 1,117 grs.	Carbon .....1,201 grs.	Carbon .....1,099 grs.
Nitrogen ... 49 ,,	Nitrogen ..... 58 ,,	Nitrogen..... 61 ,,
QUANTITY PER RATION.		
Meat off ox heads 2 oz.	Meat off necks of beef ..... 1½oz.	Meat off leg of beef ..... 2 oz.
Bones do. 2⅓	,, pigs' heads 1	Bones do. 4
Pearl barley..... 2	Bones of beef..... 1	Barley 1
Rice 1	Barley 2	Split peas 1
Oatmeal 1	Split peas 1	Onions 1
Water to make 1½pts.	Peameal..... ½	Carrots (crushed) 2
Pepper, salt, and herbs.	Onions 1	Oatmeal 1
	Carrots 1	Water to make 1½pts
	Turnips 1	Pepper, salt, and various herbs.
	Water to make... 1½pts	
	Pepper, salt, and herbs.	

There is also a formula for milk soup, for which I must refer to the report, p. 448.

It is desirable that dried herbs be used, and these, with the other vegetables varied on each occasion. This with bread alone, or, better still, with some kind of pudding, would suffice for the dinner on the soup days.

The use of tea and coffee should be restricted to the aged and the sick, or to special occasions.

In reference to fresh vegetables, when they are bought, it should be observed that, as they are dearer than bread, their use should be limited, but when they are grown by the labour of the paupers they promote healthful exercise, and supply food at a nominal cost. It is important to bear in mind that the necessity for any given quantity of fresh vegetables is relative only, whilst they may be eaten with equal advantage in large or in small quantities, provided there be a corresponding supply of other fresh food.

DIETARY AT PUBLIC CHARITIES.

The subject of dietary in connection with our orphan asylums and other public charities, well deserves scientific inquiry under the direction of the Government, but as the most rigid economy would be out of place there, I do not purpose to include it in the present paper.

DIETARY IN PRISONS.

The consideration of the dietary in prisons is of greater necessity than that in workhouses, not that the importance of the latter is less, but that the difficulties of the former are greater. There is no reason whatever why the dietary of our workhouses should not be finally settled at once, so that it might be uniform or equivalent everywhere, and be so adapted to the wants of the system that our youth should grow up healthy, and fitted for hard labour, and our adults not be tempted to the workhouse by richness of the food, and so that, whilst the food supplied is adapted to the wants of the recipients, it shall be supplied on principles of strict and true economy. But it is not so in prisons. You are aware that a Royal Commission has recently inquired into the present convict system, and a Committee of the House of Lords into that of county and borough prisons, whilst a special inquiry in reference to the system pursued in Hants has been made by the magistrates of that county. All these have reported and made various recommendations, but leaving the correction of evils of the dietary to further inquiry.

In prison discipline there are but two circumstances affecting the dietary which render it different from that of workhouses, for in both alike it is a duty to sufficiently feed the inmates, and to do this with the greatest economy. These are simple confinement with its implied restriction of fresh air, and exertion, and mental activity, and the influence of the labour exacted under hard labour sentences; and where these two influences have been estimated in a scientific manner there can be no difficulty in establishing a system of dietary which may meet the wants of the prisoners, and be everywhere uniform or equivalent.

Now what is our knowledge upon these two subjects. As to the effect of seclusion, we know theoretically that it would lessen the activity of all the vital functions, and thereby in itself be attended by less waste of the tissues of the body, and so far less food would be needed (as each of us would find if we kept in our room for a week), but practically it has been found that the weight of the body is lessened in confinement, a fact, resulting either from the deficient supply of food which was obtained, or from a diminished use made of that food, and hence, without proving either alternative, it was concluded that more food was required in a state of seclusion than would have been necessary in the ordinary circumstances of life. Upon this was based a scheme of dietary which was accepted by Government, in which the quantity of nutriment varied with the duration of imprisonment, in the following remarkable manner:—

Imprisonment.	Weekly. Carbon.	Nitrogen.
Class 1, 1 to 7 days,	19,860 grains,	889 grains.
,, 2, 7 days to 21 days	26,748 ,,	1,211 ,,
,, 3, 21 days to 4 months,	29,588 ,,	1,323 ,,
,, 4, 4 months and above,	33,782 ,,	1,566 ,,

As the compilers of this scheme were instructed that the dietary was not to be an instrument of punishment, it follows, that, in their opinion, mere duration of seclusion excited such an influence as to demand nearly double the amount of food at one period which was required at another, and that meat was required only in the conditions of the 3rd and 4th classes. It is usual to say that according to this scheme, the amount of food must be increased as the duration of imprisonment increased—or, in other words, that the effect of seclusion is a necessity for increased food, but in truth, if there be any logical sequence in the scheme, it is the contrary, for it begins with an amount of food which we have shown to be only about half of that which is required by the system, and it is only when the seclusion has continued 4 months that it is thought necessary to supply as much food as the system really requires. The truth is, that in ascertaining the cause of the loss of weight by seclusion, there were two valid agencies, only one of which was considered, and absurd as it may seem, it was not seen that giving a man only half the food which he required would lead to loss of weight of body, apart from any other agency whatever.

But the recent experiments made by Mr. Milner and myself for the British Association, by which not only the change in weight, but the quantity of nutritive and effete matters entering and leaving the body was ascertained in a scientific manner, it was proved that seclusion with inactivity does lessen the vital activity of the body, and causes a larger portion of the food to leave the body unused than occurs under ordinary circumstances, and hence that the ordinary diet out of prison would not suffice for the same person in prison without labour. The remedy for this is simple, and I shall again refer to it.

Then as to the relation of food to prison punishments. It may be known to you that these punishments are usually oakum-picking, turning a crank, or working a handwheel, and to these are added in some prisons the exercise of the shot drill, or various kinds of handicraft. There is the greatest diversity in the labour exacted by these methods, as I shall subsequently prove, but in addition to this, there is the greatest diversity as to the selection of them and the rotation of their use in different prisons. Thus, as I placed upon record more than five years ago, we find that in our county prisons some find no labour at all, others only that of ordinary trades, others have crank labour alone, others treadwheel labour alone, whilst in many, one of the two, or both of the two latter forms of hard labour are conjoined with some kind of trade. In many the treadwheel and crank are unprofitably employed, whilst in others they are used as mills or pumps. In some, women even work the crank and the treadwheel.

In some the treadwheel and crank are exceptional employments; in others they are universally used, but for a small part of the sentence; whilst in a third class they are the constant employments during the whole term of imprisonment. In most gaols they are chiefly employed for short sentences, and therefore for small crimes, and with insufficient food, whilst the light occupations are reserved for long sentences, with greater crimes, or frequent repetition, and excessive food. In some they are worked for an hour without intermission; in others thirty, twenty, fifteen, ten, and down to four minutes only. In some they are enforced for three hours daily, and simply as exercise; whilst in others the labour endures ten hours. In many, boys of fourteen years of age work the wheel and the crank; whilst in others, able grown men make shoes or pick oakum only.

In some the ordinary rate of the ascent on the treadwheel is fifty-six steps per minute, whilst in others it is so low as thirty. In some the ordinary pressure on the crank is seven pounds; at others, twelve pounds; the pressure being certain, and demonstrated by weights in one, and uncertain, depending upon the turn of a screw, in another. In some the ordinary number of revolutions per day is 14,400; whilst in others, in which the crank is still the chief instrument of punishment, it varies from 13,500 to 6,000 or 7,000, at the discretion of the surgeon, the prisoner being still without disease. In some the day's work may be performed in any part of the twenty-four hours with the index in sight of the prisoner; whilst in others it must be performed before the night, and with the index outside the cell, and so that the prisoner is unable to ascertain, from time to time, how much labour he has yet to perform. In some pumping is employed for an hour only, and even during that short period, as at Reading, there is no method of determining if any individual prisoner is labouring or not; whilst in others the labour is for the whole day pumping water into the sewers.

Oakum-picking is no labour in one prison, and hard labour in another; and in the latter it is two pounds for a day's work at Wandsworth and Westminster, and three pounds at the Coldbath Fields, whilst it is five pounds at a workhouse. In some the prisoner by good conduct obtains lighter labour, a commendatory badge, and a pecuniary reward; in others it is treadwheel from the first to the last; whilst in many, as at Wandsworth, the change of labour is due neither to crime, sentence, nor conduct, but to the number of prisoners.

With such diversity in the conditions upon which the dietary must depend, the Government Commissioners did not attempt to determine the true influence of each agent, neither did they insist upon a uniform plan of punishment being adopted before they prepared a scheme of dietary to meet it, but simply by ascertaining the effects of given dietaries upon the weight of prisoners condemned to hard labour (no matter what and how varied that labour was) they framed a scheme which should not only meet the requirements of the labour exacted (itself unknown), but be equal to the effect of simple seclusion without labour,—that also unknown. The result of such extraordinary guessing was, as might be expected, most anomalous. Thus, during an imprisonment of 7 days, no difference of food was supposed to be required, whether the prisoner performed the most severe labour with which we are acquainted—treadwheel labour—or was entirely at rest. Under 21 days, (tread-wheel, and other hard labour, being exacted,) he obtained as an equivalent for each 7 days' labour over the requirements of rest, only 1 pint of soup (containing 3 oz. of cooked meat, 3 oz. of potatoes, 1 oz. of barley-rice or oatmeal, and 1 oz. of onions, or leeks), affording about 1,100 grains of carbon, and 55 grains of nitrogen, or enough to meet the requirements of continued tread-wheel labour for about 1½ hour only. For longer terms hard labour for 21 days was considered equal to no labour for 4 months, and to need the diet, class 3, which is below that of the unemployed Lancashire operatives, and for 4 months to be equal to no labour for an indefinite period, and to require the dietary of Class 4, containing enough food to supply the wants of the system on the ordinary conditions of out-of-door life. When the term of hard labour exceeded 4 months, it obtained a dietary of its own, in which 4 oz. of cooked meat was given four times, and 3 oz. thrice a week with bread, vegetables, gruel, and cocoa, containing 36,603 grains of carbon, and 1,610 grains of nitrogen, a dietary more expensive and luxurious than the others, but not greatly exceeding No. 4 in nutritive value.

The utter insufficiency of the allowance made for hard labour may be more strikingly seen when I quote the effect of these punishments as experimentally proved by myself side by side with the requirements of the system of the unemployed labourers.

Thus, the Lancashire operatives, when unemployed, required 30,100 grains of carbon weekly. Average crank labour requires 45,000 grains, and treadwheel labour 60,000 grains; but the amount allowed to the prisoners at hard labour is 19,860 grains, 26,748 grains, 29,581 grains, 33,782 grains, and 36,603 grains, quantities differing among themselves to the amount of nearly double of the least quantity, and below the maximum required quantity from one-third to three-fifths.

Surely no further proof can be required to show that no uniform dietary could be possible under so many varying and controlling conditions, and that in providing this scheme the information on which it was based was most defective, and that guessing, in a great degree, took the place of scientific deduction. Hence, in the absence of evident and sound guiding principles, it is not to be wondered at that the scheme was not accepted readily by the visiting justices of prisons, and even now from one-third to one-half of these prisons reject it, and adopt schemes which themselves are even less based on principle, and which exhibit the most astounding diversity.*

In the public inquiries in reference to Houses of Correction, before quoted, there was an evident desire to correct this evil, and to propose dietaries which should more nearly represent the accurate scientific knowledge of the day; but the result showed that such a course was impracticable.

In answer to question 914 of the Committee of the House of Lords—"Do you suppose that it would be possible, eventually taking into account the difference of constitution, to frame a uniform table of dietary for all prisons?"—I replied, "I cannot see the least difficulty, only that we should require a large amount of certain kinds of knowledge which are necessary. For example, the points upon which we are at present deficient in knowledge are these:—We want to determine precisely the effect of mere confinement upon the system; we only know in a general way that it does depress the system, but it must be determined precisely. Then we want to determine precisely the effect of meat, as to whether it is necessary in any and in what quantity. Then whether fat, which is a dearer food than starch, but analogous in composition, can be supplanted by starch, and in what proportion it must be given. We must also know what is the precise effect upon the system of those various punishments which are to be recommended, and having first decided upon the punishments, we must know what would be the amount of food necessary to meet such particular case, so that we have many subjects about which we are at present ignorant, and which are absolutely necessary to be understood before we can form a new scheme of dietary, but all of which information can be obtained by proper experiments in prisons."

When this evidence was quoted by the chairman to Dr.

* I cannot on this occasion enter further into this question, but would refer to my papers published in the *Philanthropist* for 1856, and to the evidence given before the House of Lords, in 1863.

Guy, and the question asked (No. 3,799), "Would your opinion go along with that view," that gentleman replied, "I think I may answer, that in a scientific point of view it would be desirable to have such experiments made, but I do not think them necessary in a practical point of view. We do not want to ascertain those points with such minute precision as the term scientific would imply—we can get at them roughly. I repeat that I should myself like to see the basis that I have mentioned adopted, namely, one pound of bread per day and one pound of potatoes (that is what was given in the fourth experiment at Pentonville), because the potato element is so essential to a sound dietary, and then varying the quantities of other things. I should be satisfied with making these experiments in the case of prisoners variously employed within our own prisons; some with hard work, some with a little lighter work, and some few could be found with no work at all, or such very light work as is almost tantamount to no work, for instance, picking tow, which is very light work; but I do not think it necessary to make these experiments in so scientific a manner as is laid down in that evidence." To the further question, No. 3,801, "I think the Committee understand what your view is; that though it is not absolutely necessary, in a practical point of view, that the point should be determined with scientific precision and minuteness, still that it would be very desirable to go into these different questions with a view to obtaining an ultimate finality, so to speak, to the dietary basis, whatever it may be, which may be hereafter adopted." The answer is, "It would be desirable to make such experiments."

Hence it may be accepted that, before the present evils can be corrected, there must be a large amount of information obtained upon the most recondite questions to which physiological and chemical knowledge can be applied, and which would require for its proper attainment the greatest skill and familiarity with the subject which the present day can afford. But here arises the most important questions, Are we to be satisfied to "get at them roughly;" and Do we "not want to ascertain these points with such minute precision as the term scientific would imply?" Are we to set aside the increased knowledge of our day, with the improved means and methods of inquiry which, if used, would conclusively prove the facts required, and fix the dietary upon a firm and final basis, or pursue the unsatisfactory course adopted twenty years ago, taking weight of body, with its variation in mere fluids and in fat, as an apology for a scientific guide, and by making such so-called experiments in a convict prison, where there are not the hard labour of the crank and treadwheel, blindly guess at the dietary necessary in county prisons with their treadwheel and crank labour; or, worse still, will it suffice to ask the advice of visiting justices as to the value of the dietary under their supervision, and frame new dietaries upon their opinions? Surely such a course would not be creditable to our day, and would lead to a continuation of the present evils. There is no clashing between experiments made "in a practical point of view" and got at roughly, and those made with scientific precision. What is scientific precision but an exact basis for practice? and what are results got at roughly, and in a practical point of view, but those arrived at by a neglect of the only means by which exactitude can be demonstrated, and therefore only guesses at truth? I trust that we shall agree that the national importance of the subject demands that this question be now so considered that it may be finally settled.

The following are the questions which, in my opinion, now demand solution:—

A.—Shall the principle be adopted which was finally laid down by Sir James Graham, that the dietary shall meet the requirements of the prisoner under the different conditions of prison discipline, and thus maintain his health and strength, or shall it be made an instrument of punishment, and for any period be insufficient for the wants of the system? Without this, no step can be taken in the inquiry, and it must be for the legislature to decide the question. It must, however, be borne in mind, that if it be decided to give insufficient food, you take the subject out of the hands of science, and must let justice fix the amount of deficiency, for although it is evident that deficient food must lead to injury of health, as its action is slow and the different degrees of health are not marked by clear lines, it is impossible to estimate accurately the injury inflicted. It is a dangerous mode of punishment, and particularly when it is often repeated.

B.—The system to be pursued in gaol discipline must be fixed so that a sentence shall always and everwhere carry with it an absence of labour or a definite kind and amount of labour. Hence it must be determined whether labour shall be a part of all gaol discipline or not, and certain kinds of labour must be selected and prescribed, and thus the sentences may be without labour, with medium labour, and with hard labour. In my evidence before referred to (Question 842), I affirmed the principle that labour should be a constituent part of every sentence, on the ground which at first sight may appear paradoxical, that, within limits, it would allow the food supplied to be less costly, for without labour it has been shown that food is wasted, and either the system must be ill-nourished, or the higher kinds and more costly food, as meat, must be given so as to supply an increase of vital stimulant in the form of nitrogen. In some cases, therefore, it may be shown that the exertion supplies its own food, and as this is a most important principle, I will quote the answer which I gave to Question 827, "Would you explain to the committee a little on what principle you would act in that case?" "It would seem to me that the right course of proceeding would be this, to determine the amount of food which is necessary to maintain a person in fair health in the open air, and to endeavour so to arrange that it shall also maintain the prisoner in health in a state of confinement. The difference of the two conditions is mainly, or perhaps entirely, this, that in confinement you have less vital action in the body, less digestion of food, and less assimilation or conversion of food into the tissues of the body. The aim, therefore, should be so to arrange the prison discipline that there shall be such an increase of this assimilation over the present amount, with inaction, as shall enable the cheap food, which is sufficient for the support of an agricultural labourer, to keep the prisoner in health. If that be not done, it will be necessary, as we do at present, to give more nitrogen. With the deficient assimilation existing in confinement, you must increase the vital action of the body; but if you adopt the other course, that of giving, exercise and fresh air, such as a labourer would have you do not need to give a proportionate increase of nitrogen; you therefore assimilate the conditions of the prisoner much more to those of an ordinary labourer, either in quantity or in quality. I also give my assent to the proposition contained in question 836, viz., "Whenever you have a deficiency of labour you might make either the labour or the open-air exercise, whichever it may be, more or less a substitute for the amount of nitrogen which otherwise would be supplied in meat."

Sir Joshua Jebb assented to this statement, when it was referred to him in Questions 1,290 and 1,291. Thus he answered:—"I think that the fact of prisoners in separate confinement requiring a very large amount of food to support them against the depressing influence, as it is termed, of separate confinement may partly arise from the less amount of exercise they get, because it is really a fact that though the men are not required to use great bodily exertion in the trades which they carry on, they do require more food than men would require out of doors." And in answer to the following question:—"So that if a proper amount of exercise were given to the prisoners, with a proper amount of fresh air, they might still be subject to the hard fare which you think is necessary as a proper punishment without its exercising any deleterious effect upon their system." Sir Joshua answered "Yes."

So also when the statement was referred to Dr. Guy, he answered (No. 3,733), "I think that the exercise which a man takes, whether you call it hard labour or any other labour, tends to promote the assimilation of that food which he eats." Hence it is admitted that the plan proposed by me would effectually dispose of the evils of seclusion, and would improve the nourishment of the system, and so far allow of less expensive food being given to maintain health.

When the several kinds of hard labour have been selected it would be easy to render their action nearly uniform, and their precise influence upon the body can be determined and the amount of food to be supplied ascertained. My own experiments on crank and tread-wheel labour, and shot-drill are the only ones on record, and may be found in the Report to the British Association for 1861, but it may be well to quote a part of the substance of the answer to Question 845: "Crank labour increases waste from two to three times during the exertion, and in the whole 24 hours the increase is 1½ time. Treadwheel labour increases it 5½ times during the labour, and twice when calculated upon the whole 24 hours. Shot drill increases it four times during the period of exertion. Hence the information is already acquired for the experimental application of foods to labour.

C.—The mode by which the amount of food required in these different conditions would be determined, and the effect of various kinds of food is very simple. Besides the evident effect upon the body, as shown by variation of weight, colour, firmness of muscle, colour of blood, strength, &c., it would only be necessary to determine by chemical analysis the amount of unused food passing off by the bowels. The general plan of procedure is stated in my answer to questions 915 and 916. Thus—"I should first take a basis dietary, such as is used by the agricultural population, and such as I think would be suitable for persons condemned to light labour or not to hard labour; with that dietary I should think it necessary that they should have so much exercise or so much labour in the open air as should induce the whole of that food to be assimilated. That is the great difficulty which must be overcome by experiment, viz., to find out what amount of labour is necessary, with a given dietary, to enable the whole food to be assimilated. For that purpose it would be necessary to take five prisoners of average age and power, and place them upon this dietary, to determine every day the effect upon the weight of the body, the colour of the blood, and also the effect upon the excretions, that is to say, to prove whether due assimilation occurs, by determining the amount of food passing off by the fœces. That is the only scientific inquiry which is necessary. If it be shown that the whole of the evacuations were so reduced in nutritive value as to be only equal to that of an ordinary individual of the community, then we should suppose that a proper proportion of the food was assimilated." "Having first of all settled this question (which might require a great deal of variation in the elements of the food) with regard to light labour, and having determined also the proportionate effect of the different kinds of hard labour upon the system, I should be able to devise experimentally a scheme of diet which would meet the case. I should take five persons upon each of the systems of hard labour, and put them upon that dietary, and determine in the same way the effect of this food upon them. In the course of twelve months I have no doubt that a sufficient number of expriments would have been made to settle the whole of these questions."

D.—I think it is to be regretted that notwithstanding the admitted necessity for the foregoing experiments, Dr. Guy should have allowed himself to present six schemes of prison dietary in which meat and bacon are entirely excluded, and more particularly when the real nutritive value had not been ascertained and apportioned to the condition of labour, and when no other conditions were recognised than that of duration of imprisonment. This seems to be supported by the answer to question No. 5,325. "Is this diet one which you have drawn up in order to show how a diet may be framed without the meat element in it?" The answer is, "I have partly drawn it up to show how a diet may be framed without the meat element in it, but at the same time I should be prepared to recommend it for trial;" and in answer to the preceding question, "whether he would be afraid of employing a man upon this diet, if the allowance of hard labour ran as high as 6 or even 8 hours a day?" the answer was, "No, I should not be afraid of it; at the same time all these suggestions require to be tried," shewing that, at the best, the dietaries were but guesses, and could not be adopted until that which should have preceded them had been effected, viz., scientific inquiries into the subject.

On calculating the nutritive value of these proposed dietaries with those so long in use by the Government, I find very remarkable differences. Thus:—

	Proposed Dietaries.		Home Office Dietaries.	
	Carbon.	Nitrogen.	Carbon.	Nitrogen.
Class 1	13,930	546	19,860	889
„ 2	16,625	630	26,748	1,211
„ 3	22,525	875	29,588	1,323
„ 4	36,834	1,755	33,782	1,566
„ 5	41,979	1,932	36,603	1,610
„ 6	48,412	2,352	...	...

The first three classes in the Government dietary have already been shewn to be below the natural requirements of the system, but in the proposed dietary the nutriment is lower, so that the third class is only equal to the Government first class, and the results at the end of twenty-one days must be deplorable. There is then a sudden increase from the addition of Indian corn and milk, and an increased quantity of oatmeal quite disproportionate to the progressive increase in the duration of imprisonment, and so great that the quantity allowed to the preceding class is nearly doubled, whilst the whole of the 2nd, 3rd, and 4th classes in the Government scheme are passed over, and one bound made from the lowest to the highest class. The nutriment in the proposed 4th, 5th, and 6th classes is much above that of the highest class of the Government.

E.—Is it not remarkable that at this day it is still customary to compare dietaries by quoting the number of ounces of fluids and solids which they contain, as though there were no material difference between 1oz. of potatoes and 1oz. of cheese, oatmeal, or tea, and not only so, but to reason upon the results as if they were all equal. This is illustrated by the proposed dietaries just quoted, where the two first classes have the same gross weight as those of the Government scheme, whilst their nutritive values are so different. In this mode no account is taken of the 2 oz. of oatmeal in each pint of gruel, nor anything of the nutriment contained in the milk.

F.—In prison dietaries, suited to county and borough prisons, no unusual article of food should be introduced, as, for example, Indian corn meal, which is not thought equal to wheaten flour by any people even in the Western States of America, since a distasteful food certainly lessens the appetite for food, and, being less perfectly assimilated, will, for one or both of these reasons, increase waste of food and less perfectly nourish the body. Hence, apart from the disgust of the prisoner, it is not sound economy. It is, doubtless, possible to effect this in convict prisons with long sentences, since in progress of time the body will acquire the aptitude for a new food; but even then it has not been shown that the very large amount of food which they are said to require may not be due to the imperfect use of that which is adopted.

G.—The necessity for fresh vegetables daily is doubtless

much less now than formerly, since there is now abundance of other fresh food. Conditions of prisons which led to scurvy 30 years ago, included many other elements besides a diminished supply of fresh vegetables, and there is no instance to be found on record where, with an abundant supply of fresh meat and bread, scurvy ever appeared. Even in the Arctic regions, as Dr. Hayes and Dr. Kane have abundantly proved, the necessity for fresh vegetables never occurs whilst there is plenty of fresh meat, and, indeed, the Greenlanders never suffer from scurvy when their food is plentiful, although they never obtain vegetables. Such conditions as those quoted at Millbank do not now occur in any part of England; and as potatoes are a much dearer food than flour or oatmeal, their use ought to be restricted as much as possible, provided there be a sufficiency of other food allowed. In my inquiries in Lancashire and elsewhere, I have found many who have not eaten fresh vegetables for many months at a time, and yet found no evil to result.

H.—In concluding this subject, I may remark how false is the comparison which is made between prison dietaries and those of workhouses, or those of ordinary life. We have already seen that the three first classes in the government scheme contain less nourishment than that supplied to the Lancashire operatives; and it is only in the fourth and fifth that sufficient food is allowed. As to the relation of these dietaries to that of the community out of doors, the information about to be issued will supply abundant means of comparison. But with regard to workhouses, there can be no doubt that the three classes referred to are below any workhouse dietary.

I have only one further remark to make, and that will have reference to the unfair position in which medical men are now placed in reference to this and other subjects. It is expected not only that medical practitioners shall be well fitted for the practice of their profession, but that they shall also be authorities upon the various recondite questions which are only accessory or incidental to their practical knowledge. Hence upon questions of lunacy, public health, poisoning, and dietary, it is expected that any medical man who may be in any way connected with the case under investigation should give opinions quite in accordance with the most advanced knowledge of the day. This is not required in other occupations in life. A graduate in arts must be acquainted with mathematics, but is it expected that every graduate should be able to fill a professorial chair, or to resolve the most abstruse problems of the science? Is a lawyer expected to be familiar with each department of the law, or an artist equally capable of excellence in every walk of art? Why, then, is it not well recognised, that the essential duty of a medical practitioner is capability for the treatment of disease, and that questions on collateral subjects should be regarded as special ones, to be solved not by the busy practitioner, but by those specially given to such investigations. It is unreasonable to require a workhouse or gaol surgeon to give a scientific opinion upon, and to frame dietaries for those under his care if the aim is to pass beyond the region of ordinary observation and to establish something recondite, as for example a dietary which shall sufficiently nourish the body at the least cost.

DISCUSSION.

Mr. HARRIES (Poor-Law Board) said he rose to offer a few observations on the very able paper of Dr. E. Smith. He had a very large family, numbering somewhere about 120,000, and it might not be out of place to say a word or two respecting this family—the poor in workhouses. Sir James Graham, in 1843, sanctioned five scales of diet for prisoners, and the amount of food in each scale was regulated according to the length of imprisonment and hard labour. Prisoners imprisoned for short periods got the lowest dietary, class 1; and those whose sentences were the longest the highest dietary, class 5. In the parliamentary paper, issued in 1857, containing the dietaries of prisoners, there were, exclusive of convict establishments, 86 prisons, and in these there were altogether 378 dietaries. Four prisons had 1 dietary each; 2 had 2; 11 had 3; 10 had 4; 57 had 5; 2 had 6. For the sake of distinction he would call Sir James Graham's dietaries official dietaries, and those which differed, non-official dietaries. Now, the official dietaries, as issued, were in use in 30 prisons, and in 4 more, but with different periods. In several others some of the scales were in use. The case stood thus:—

	Official Dietaries.	Non-Official Dietaries.
The 1st Class Dietary in use in	50 prisons	31 prisons
The 2nd ,, ,, ,,	44 ,,	37 ,,
The 3rd ,, ,, ,,	39 ,,	42 ,,
The 4th ,, ,, ,,	43 ,,	31 ,,
The 5th ,, ,, ,,	35 ,,	24 ,,

With regard to the non-official dietaries, it was difficult to find out the principle upon which they had been framed—if, indeed, there was any principle in the matter at all. The amount of nutriment was less in the second class dietary than in the first in the prisons of Westmorland and Huntingdon. It was less in the third than in the second, in Devon, Cambridge, Spalding, Horsemonger-lane, Wakefield, Denbigh, Morpeth, Tynemouth and Hexham. It was less in the fourth than in the third in Durham, Falkingham, Cambridge, Monmouth, Usk, Morpeth, Tynemouth, and Hexham. It was less in the 5th than in the 4th in Anglesey, Nottingham County, and Nottingham House of Correction. All the dietaries prescribed three meals a day, except St. Albans, where only two were given, breakfast and dinner. There was no reason given for this arrangement. He supposed the digestive powers of the criminals in this place were not so active as elsewhere. Prisoners committed to Cumberland gaol for seven days got only 18oz. of bread per day; while prisoners in Alnwick gaol for the same period (seven days) got 16oz. bread, 12oz. oatmeal, and 1 pint of milk per day. The amount of nutriment in the latter was about three times that of the former. The weekly quantity of food, inclusive of the ingredients in the liquid food, in these dietaries was:—

	I. CLASS.	II. CLASS.	III. CLASS.	IV. CLASS.	V. CLASS.
	oz.	oz.	oz.	oz.	oz.
Official Dietaries	145¼	209¼	259¼	269¼	334
Average of Non-Official Dietaries	183¼	234¼	273¼	287¼	327¾

Now, measuring these dietaries according to the data at the Kensington Museum, supplied by Dr. Lyon Playfair, the amount of nutriment was:—

CLASSES.	Quantity of nitrogenous ingredients.	Quantity of substances free from nitrogen.	Quantity of mineral matter.	TOTAL.
	oz.	oz.	oz.	oz.
I. CLASS.				
Official dietaries	11·45	79·36	2·61	93·42
Average of non-official dietaries.	14·18	91·38	3·19	108·75
II. CLASS.				
Official dietaries	16·14	108·47	3·55	128·16
Average of non-official dietaries.	17·31	105·81	3·98	127·10
III. CLASS.				
Official dietaries	17·32	112·03	3·87	133·22
Average of non-official dietaries.	20·44	115·84	4·28	140·56
IV. CLASS.				
Official dietaries	21·00	119·45	4·08	144·53
Average of non-official dietaries.	21·93	119·67	4·40	146·00
V. CLASS.				
Official dietaries	21·46	129·07	3·97	154·50
Average of non-official dietaries.	22·11	124·20	4·58	150·89

The weekly cost of these dietaries was—

	I. Class.	II. Class.	III. Class.	IV. Class.	V. Class.
	s. d.	s. d.	s. d.	s. d.	s. d.
Official Dietaries	1 2¼	1 9¾	2 1¾	2 9¼	3 0¾
Average of Non-Official Dietaries	1 5½	1 11	2 5	2 7	2 10

With regard to the dietaries of workhouses, able-bodied paupers were not dieted according to any uniform rule—their dietaries varied in different workhouses. The dietaries of insane, too, in lunatic asylums varied considerably. The average quantity of food for the able-bodied man in the workhouse was 243¾ oz. per week; for the insane man in the lunatic asylum, 263½ oz.; for the male prisoner, the average of the 2nd, 3rd, 4th, and 5th scales was 269½ oz.; for the male convict, the average of Pentonville, Millbank, Chatham, Portland, and Portsmouth dietaries was 366 oz. A better estimate of the relative value of these dietaries might be formed by measuring them according to Dr. Playfair's data. The amount of nutriment was:—

	Quantity of Nitrogen Ingredients.	Quantity of Substances free from Nitrogen.	Quantity of Mineral Matter.
	oz.	oz.	oz.
Able-bodied Man '.....	22·10	102·91	4·36
Insane	23·45	104·84	4·02
Prisoner.....	19·57	116·88	4·01
Convict	25·15	137·71	4·47

The weekly cost of the dietary of the pauper was 2s. 3¾d; insane man, 2s. 6¾d.; prisoner, 2s. 5d.; and convict, 3s. 10¼d. The subject of the dietaries of prisoners had of late attracted considerable attention; and during the last session, the Lords appointed a committee on prison discipline, and that committee received a large amount of evidence in reference to dietaries. In the report of that committee the dietaries recommended by Dr. Guy were given. Now, to these dietaries there were decided objections. The first objection was, they prescribed no meat. The present dietaries allowed meat more or less, and the average weekly quantity of the several scales which allowed meat was 15¼ oz., in a cooked state. In the workhouses the average quantity to an able bodied man was 16¾ oz.; to a male lunatic in an asylum, 26 oz. There was no doubt that the poor in this country did get meat, but the quantity was very small in some cases. There were, too, in these dietaries, objectionable articles of food, viz., milk and Indian meal. Our knowledge in this country of Indian meal was not sufficient to warrant its use in large quantities in prisons. To milk there was no objection as an article of diet, but the poor of this country did not get it in such large quantities as that proposed by Dr. Guy, viz., seven pints and ten pints a week. Now if we compared Dr. Guy's proposed dietaries with the official dietaries (Sir James Graham's dietaries), the following was the result:—Dr. Guy's 1st class dietary prescribed 23 per cent. less food per week than the official dietaries; the 2nd class, 20 per cent.; the 3rd class, 24 per cent; the 4th class, 48 per cent. more; the 5th class, 40 per cent.; and the 6th class, 69 per cent. more than the 5th. As regarded nutriment, Dr. Guy's 1st class dietary was 32 per cent. less than the official dietary. The 2nd class, 39 per cent.; the 3rd, 24 per cent; the 4th, 25 per cent. more; the 5th, 33 per cent., and the 6th, 45 per cent. more. He believed the Government had appointed Dr. Guy and two other medical gentlemen to inquire into the subject of the dietaries of prisoners. Now, these dietaries of Dr. Guy's were, he supposed, forecasts—if so, he had no faith in them. The important question to be considered was, ought the dietaries of prisoners to be revised or not? In answering this question, he would quote from a letter he addressed last year to the Royal Commissioners on penal servitude, the reasons why he was of opinion that the dietaries should be altered:—"1. Because the labour exacted of the convict is not greater than that performed by the agricultural labourer, and hardly in excess of that required of the able-bodied man in the workhouse. 2. Because the diet of the convict is much in excess of the diet of the several classes mentioned. 3. Because the convict is placed, in regard to food, in a better position than it is possible for the honest labourer to attain. 4. Because this is a temptation to crime. 5. Because it is unjust to the convict whose physical condition has been raised above its usual level, and hence he is placed, on his release from prison, if unreformed, in a better position to commit crime again. 6. Because the cost of the diet is greatly above that of the pauper, the lunatic, and the agricultural labourer. 7. Because of the expense—it being unjust to the public to have to pay 4s. a week for the food of the convict while the poor lunatic and pauper can be properly maintained at an average cost of only 2s. 4d."

Mr. MERRY said, as an old visiting justice of one of the model prisons in a neighbouring county, and having had the honour of being examined before the Lords' committee on the question of prison discipline and dietary, he was desirous of making a few remarks on Dr. E. Smith's valuable paper. If they wished imprisonment to deter from crime, they must cease to supply such an excessive diet as to afford temptation to a poor man to commit crime in order to get into prison. He held the opinion that a man ought to be really punished when he was sent to a prison. He would not injure his health, but he would take care not to give him an ounce more food than his constitution required. In looking at the question of food with regard to public dietaries, Dr. Smith's paper had taught him the value of the quality of food rather than the mere quantity; and he thought, with reference to what had fallen from the preceding speaker, that it was impossible to lay down one general dietary that would suit all counties and all populations alike. The diet of the labourer in Wiltshire or Berkshire differed very much from that in Yorkshire. He thanked Dr. Smith for telling him the value of a pound of a particular article of food, with reference to the amount of carbon and nitrogen it contained; and if the physiological definition of man was that he is a "cooking animal," it was useful to know the nutritive value of the food he was going to cook. The serious question affecting the great bulk of the community was this, that upwards of 100,000 criminals annually left the prisons of this country, and it was important to consider what was to become of that army of 100,000 enemies to society. If such men had an abundant diet in prison, they got so accustomed to that kind of food that they could not do without it when they came out of prison. They were driven again into crime in order to obtain it. To every thinking man, therefore, the investigations of Dr. Smith on the subject were of the utmost value, and might be considered of importance in a national point of view.

Mr. CARDWELL was desirous to ask a question upon one point in the paper. He understood Dr. Smith, speaking of private dietaries for the poor, to recommend Indian corn meal as a cheap and nourishing article of food; but in speaking of prison dietaries he also understood Dr. Smith to state that that article would not do for a continual diet, inasmuch as it was somewhat disgusting to the appetite, and prisoners would not thrive upon it. It seemed to him somewhat anomalous to recommend, as the continual diet of poor persons not in prison, that upon which Dr. Smith had stated prisoners would not thrive.

Dr. SMITH said in none of his dietaries had he recommended Indian corn meal, but he had stated with regard to private dietaries, in cases where persons could not procure more food than was actually necessary for the sustentation of life, that Indian meal was obviously the cheapest in proportion to the amount of its nutritive qualities.

Upon that principle it was largely used by the Irish, but when they could obtain better food they invariably abandoned it as not agreeable to the appetite. In long imprisonments in convict establishments the body might become used to Indian meal, and the distaste for it might cease, but it was not suited for short imprisonments.

Dr. LANKESTER, F.R.S. (responding to the chairman's invitation), said he should be very happy to say a few words on Dr. Smith's paper, but he had on this occasion dealt more with details than in the previous paper, and therefore it was more difficult to follow him. At the same time he felt that these contributions of Dr. Smith to the philosophy of diet were of very great importance; and even if he (Dr. Lankester) and others did not agree with him in every point it was very desirable that the public should be led to discuss this question in relation both to economy and health. He quite agreed with Dr. Smith that the system on which our public dietaries had been laid down was essentially a bad one. On looking at some of those dietaries he found the estimate of the diet was put down under the two heads of solid and liquid. It was impossible to come to a proper conclusion upon diet so vaguely estimated as that. Many liquid foods contained a large proportion of nutritive properties, whilst many forms of solid food were almost destitute of them. He thought the time was come when the Government of this country, in constructing dietaries for hundreds of thousands of people, should regard the subject from a scientific point of view, and it should not be left to persons accidentally placed in positions of importance to estimate what should be the diet of the people in our public establishments. At present they seemed as though they were constructed in quite an accidental way. Some recommended rice, others substituted potatoes for rice, and in that way they went on substituting one thing for another without any definite system. Within the last few years, as the result of careful investigation, they had been able to point out what really were the relative nutritive properties of various foods. Dr. Smith, in his previous paper, called attention to the fact that the two elements, carbon and nitrogen, as contained in different foods, indicated their relative value. That was a highly scientific position when contrasted with the "solid and liquid" dietaries of the ordinary Government system. He would say, however, that with regard to these scientific estimates of foods, they were not always to be relied upon as entirely correct, but this he would add—that the errors of the scientific man were infinitely smaller than the errors of the merely practical man. Those of the practical man were sometimes of the gravest kind, while those of the scientific man allowed of correction by the very means which had led him to his previous conclusions. In the discussion upon Dr. Smith's last paper, he took the liberty of saying that he did not think some articles of diet had been estimated at their proper value, in taking merely the quantity of carbon and nitrogen they contained. Now nitrogen was contained, not only in what were universally acknowledged to be the nutritive constituents of food, such as fibrine, albumen, and caseine, but it was also found in another constituent, namely, gelatine. He thought sufficient attention had not been given to this last mentioned substance. Some 30 or 40 years ago the French government directed an inquiry to be made into the nutritive qualities of gelatine, which entered largely into the constituents of soup, so much used in that country; and two members of the French Academy gave their opinion that gelatine was not a nutritive element of diet, and would not form the tissues of the body. Subsequently, there appeared a report from the Belgian Academy condemning gelatine as an article of diet, and from that time a notion had very much prevailed among physiologists that gelatine was not digestible, and, like cellulose, was not a nutritive constituent of diet. Consequently, in a diet containing gelatine, the quantity of nitrogen could scarcely be taken to represent its real nutritive value. He would ask Dr. Smith whether he had given any attention to that point. Recently it had been stated that gelatine, when converted into albumen, was very nutritious. But of this they had no proof, and it was a matter which ought, if possible, to be decided. Another point was that cheese was an indigestible article of food compared with meat and bread, and therefore it would not be correct to take the nitrogen of cheese and put it down as the true measure of its nutritive value. It seemed to him that cheese was only a suitable diet for the hard-working classes of people—persons who had a great deal of open-air exercise. A hard-working man would find it more economical to purchase cheese, if he had but a few pence to spend for his meal, than meat; but the question arose whether it was better for the wife and children indoors to have cheese? whether it would not be better in their case to expend the money upon some more digestible, though less nitrogenous, article of diet? These were questions which must arise at every point of the examination of Dr. Smith's dietaries, and they would only be determined by experience—and that not a limited experience. Then again, Dr. Smith had constructed private dietaries and said some persons had prospered on them, but prospering thereon for a month or two was different from prospering for a lifetime. He said this merely to caution people against adopting Dr. Smith's private dietaries, upon the notion that they might do so with impunity. If a person were restricted to living upon two shillings a week, it would be better to give Dr. Smith's dietaries a trial than to spend the money indiscriminately, as poor people who had no knowledge of the subject were very apt to do; but it might become a question, when a person had to feed others, whether these economical dietaries would be the best provided he could afford to spend more money upon a greater variety of food. There was also another point with regard to them, viz., that they excluded everything which could be termed luxurious diet; there was nothing for the taste—tea and sugar, and those essences which flavoured food seemed to be utterly excluded from these dietaries. He did not think it was wise to do that.

Dr. SMITH said he had not done so; tea was included in most of his dietaries.

Dr. LANKESTER understood Dr. Smith to say that tea was expensive and might be dispensed with. He did not think the highest estimate should always be put upon that which went to form tissue, but they must appeal to the palate as well as to the stomach, and they all knew that pleasing the palate had a great deal to do with the subsequent process of digestion. Therefore, agreeing with these dietaries where the object was to save money, he at the same time cautioned people against their use for any length of time, except under circumstances of compulsion. He felt this Society was much indebted to Dr. Smith for the very able manner in which he had brought forward this subject of diet, and he trusted it would raise a more general inquiry as to the nature of food. He believed the losses arising from the improper use of diet would be more than enough to feed the whole population. As to the dietaries of prisons, he did not think they ought to punish people in their diet. To carry out any systematic plan of limiting the diet to an amount on which human life could barely be maintained would be to inflict a punishment which was never contemplated. Rather than do that he would give rather higher dietaries than some had declared were sufficient for the sustenance of the body. He did not think those who watched the rations served out to prisoners would be impressed with the idea that they were living luxuriously, or that the most wretched amongst the criminals would wish to remain in durance for the sake of the food they got in prison. That it was in many cases an advantageous system, both of diet and discipline, he did not hesitate to say. Men who went in as emaciated and enfeebled drunkards, after they had submitted to this admirable system of diet and exercise, for a month or two, came out strong men. He was almost inclined to wish

that there were prisons for respectable people who could not restrain themselves within proper limits, both in eating and drinking. Six months at Clerkenwell or Pentonville would put them on their legs again, and enable them to go on prospering for years without incurring any doctors' bills.

Dr. DICKSON, following up the concluding remarks of Dr. Lankester, would state, for the information of those interested, that in Germany there were several establishments called "bettering houses," in which the benefits of the description of diet and management, spoken of as being beneficial to high livers, could be obtained.

The CHAIRMAN wished, in relation to the fixed quantities in public dietaries, to repeat the precautionary observation arising from the wide physiological differences of assimilative power, and of hunger in different individuals, that not only should the quantities of the various sorts of food be left undefined for very young children, but, as respects adults, that one simple and main article of food should be allowed without stint. Experience had shown that the extra consumption by the few who ate more than ordinary was more than counterbalanced by the economy of the many who ate less on this plan. This precaution observed, there would be little danger to health, or of making dietaries an undue punishment in prisons, nor would there be any fear of their becoming too attractive. No dietary should be adopted without due observations on the health and the strength of prisoners, and such observations were in favour of the simple and more economical diets, which were the subject of much theoretical medical apprehension. He had heard the medical men who had charge of the prisons in which the simpler diets were in use, and the personal cleanliness and other sanitary conditions of the prisoners were well attended to, often express a wish that they had their private patients in those prisons, for if they had they could frequently save them and produce the best effects. Whilst some prison physicians attributed a large part of the extraordinary improvement in health produced in well-managed prisons, with the simpler diets, to the teetotalism or entire exclusion from alcoholic drinks, others ascribed the larger share to the abstinence from the use of tea, as the improvement in the health of females who were not given to drinking was as great as that of the males who were. The observation of the effects of dietaries in classes of persons had, however, yet to be closely made and systematised. The meeting would gladly give their thanks to Dr. Edward Smith for this as well as the other important paper he had laid before them, and for the advances he had made in clearing up the medical and economical questions in relation to the food of the people. It was to be hoped that his continued labours in this field would receive due public support.

The vote of thanks having been passed,

Dr. EDWARD SMITH said that Dr. Lankester had made some valuable observations on this subject. In the first place, as to whether all nitrogenous materials were equally assimilated or digested, he would say that it was a great question, which he was anxious to have thoroughly investigated. Let them consider what had been their position lately. Till the last few years nitrogen was looked upon simply as the element which supplied muscle or flesh to the frame, while carbon supplied the fat and heat, but very curiously it was discovered by Dr. Thompson, in his experiments in the feeding of cattle, that the fattening properties of fodder were not in relation to the carbon in the food, but to the nitrogen, which was supposed to have nothing to do with the formation of fat. In the course of the experiments which he (Dr. Smith) began about six years ago, as to the effects of different foods upon the body, he ascertained that if a person took gluten or other nitrogenous matter containing very little carbon, there was an increase in the amount of carbonic acid evolved quite disproportionate to the carbon supplied by the nitrogenous food. Here, then, they had another strong proof that nitrogen acted, not only by becoming portion of the tissues of the body, but by promoting its vital actions. He had suggested to the Lords' Committee on prison discipline and dietary, that it was not possible at present to decide whether meat could be wholly dispensed with in prisons, and whether it could be supplanted by milk, which contained a large amount of nitrogen, or by cheese, which contained still more nitrogen. Those were matters which required further investigation before the final settlement of the dietaries could be determined upon. It was of the greatest moment that a society like this should feel the importance of the subject, and bring about an inquiry by which these important questions might be finally settled. With regard to cheese, it had not as yet been shown that only a certain quantity was digested; but he believed that if a person took a large portion of cheese it was not all digested. It did not, however, follow that the whole of a moderate quantity of cheese was not digested; and he had proved that on taking a small quantity of cheese, nearly the same quantity of nitrogen would be eliminated from the body, clearly showing that a small quantity of cheese would be assimilated. With reference to gelatine, he thought Dr. Lankester was in error in saying it had been shown that gelatine was not digestible. It had been satisfactorily established that gelatine was rapidly digested, very rapidly went into the blood, and very rapidly left it. The experiments of Professor Lehmann in Germany, as well as his (Dr. Smith's), showed that gelatine, after being taken four hours, eliminated as much nitrogen as was taken into the body. The only question in dispute was that raised by Bischoff and Voit, whether, as it left the body so rapidly, it could have any thing to do with forming the tissues. In his previous paper he observed that well-digested bones contained a large amount of nutritive matter. With reference to the dietaries he had mentioned, they had not merely been in use for a month or two, as Dr. Lankester had supposed, but they were the actual dietaries in use in Lancashire. In the same way dietaries had been collected from the food actually eaten by all classes of the community. Dr. Lankester had intimated that he thought these dietaries had not been made sufficiently palatable and tasty. Upon that he would say his object in constructing them was to introduce as far as possible the usual food of the population with such variations as economy would admit of; he did not go into the question of how much nourishment a man might obtain if he were in a position to spend more money upon his diet. Dr. Smith having enumerated the articles in his private dietaries, and remarked upon their variety, went on to add that there was nothing more important to be borne in mind than that there was a possibility of getting the prison diet too low. There was a disposition, at the present time, on the part of a large and influential class to lower the diet of prisons from its present scale. There could be no doubt that the large amount of mortality and scurvy which formerly existed in the prisons of this country was owing to the amount of food being too little. The Earl of Carnarvon, whilst desiring to reduce the dietary of prisoners as far as would be consistent with their health, had remarked upon the danger of the present reaction defeating its object by making too great a reduction and thus increasing sickness and mortality in prisons, and necessitating another change of the dietaries.

The SECRETARY announced that on Monday evening next, at eight o'clock, the third lecture of Mr. Burges's course would be delivered, and that at the meeting on Wednesday evening next a paper, by Dr. Marcet, F.R.S., "On Petroleum, its Economic Value, and a Visit to the Petroleum Wells of Canada," would be read.

Obituary.

WILLIAM HENRY HUNT has just died in the fulness of life and honour, the span of man's years, three-score and ten, having been completed by him three years ago; and as to earthly distinction, no man has received more of it from his fellows. As an artist Hunt was valued by all classes, although for different reasons. The learned in art prized his productions, as perfect examples of painting, and disregarded the modesty of their themes in favour of their unapproached excellence. No painter surpassed him in technical power applied to those themes Hunt made peculiarly his own, *i.e.* fruit, flowers, and what is called still-life. As a painter of interiors he held a high place; as a humorist he has long been recognised. The unlearned in art revelled in the fidelity and brilliancy of Hunt's pictures, their homeliness and beauty, and asked few questions as to their æsthetic merits. We rarely find a verdict so unanimously given in a man's favour at home; still rarer is it for us to know, as of this case, what is known—that a single painter became a member of a foreign academy while not a member of that of his native country. Hunt was a member of the Academy of Amsterdam—an honour most valuable to hold in the land of flower-painters of old. In 1855, at the Paris Exhibition, Hunt's works astonished all France, and every critic was loud in expressions of delight. Eleven drawings (Nos. 1031–41, *Grande Bretagne*), hardly satisfied the admiration of the French. The baptismal register of St. Giles'-in-the-Fields says the painter was the son of John and Judith Hunt, born March 28th, 1790. His birth took place at the house No. 8, Old Belton-street, now Endell-street, Long-acre. His father was a tin-plate worker and japanner, resident in that house, which is still used for the same trade. Hunt was strongly inclined towards art in his earliest youth, and, despite the objections of his parents, persisted in following it. He was literally apprenticed to John Varley, the famous water-colour painter, for a term of seven years. At Varley's house No. 15, Broad-street, Golden-square, Hunt met Mulready, who induced him to enter the Royal Academy and study in the schools of that institution. This he did for some years. In company with Mulready, Hunt was a visitor at Dr. A. Munro's house, No. 3, Adelphi-terrace, next door but one to Garrick's house, No. 5 in the same row; at this place he drew with what might be called the little Academy, and met many men of note. Hunt's first appearance as an exhibitor was at the Royal Academy, in 1807, when he contributed three landscapes, views near Hounslow, Reading, and Leatherhead. These were oil paintings and such as he exhibited at the same place in 1809, 1810, and 1811. In oil also were probably his contributions to the Academy in 1822, 1823, 1824, and 1825. The subjects were still-life, portraits, and interiors. Such subjects as the last-named were evidently to Hunt's taste in early life. We find that he received commissions from the Earl of Essex to paint some of the rooms at Cashiobury and part of the park and grounds at that place. At Cashiobury he first knew Dr. Munro. Hunt's first connexion with the Society of Painters in Water Colours (of which he afterwards became so distinguished an ornament) was in the capacity of "Exhibitor," *i.e.*, an artist invited to contribute to the Society's annual gathering, but not otherwise connected with the body. His first contributions, made to the tenth exhibition of the Society, 1814, were named "View of Windsor Castle," and "The Bell-tower, Windsor Castle." He contributed on this footing in 1815, 1819, 1824—where he appeared as an associate exhibitor in 1825, 1826, and 1827—when he became a full member. From this time he rarely failed to contribute, and his fame steadily grew. His last works were produced not many days before his death, on the 10th inst. He died of apoplexy, induced by a violent cold. His old friend and medical attendant, Mr. Wade, of Dean-street, Soho, possesses the finest collection of the artist's works, about thirty-nine in number. Hunt's contributions to the Manchester Art Treasures Exhibition were twenty-eight, to the International sixteen works.

Notes.

The Rotterdam steamer, which left that city on Tuesday evening, the 9th instant, brought the news of the total destruction by fire of the Schieland Palace, the well-known museum and picture gallery of that city.

GREAT EASTERN STEAMSHIP.—This vessel was on Wednesday last put up for unreserved sale, by auction, at Liverpool. She was purchased by the Great Eastern Steamship Company, a company which has recently been formed for the purpose of again running this vessel. The price at which she was purchased was £25,000.

Correspondence.

FRESCO PAINTING AS A SUITABLE MODE OF MURAL DECORATION.

SIR,—In the paper which I had the honour of reading before your Society on the above subject, two distinct propositions were enforced or implied. 1st. That mural decoration in general is in itself noble; 2nd. That the specific mode of mural decoration called Fresco, is practicable. In the discussion which took place after the reading of the paper, the former assertion was in no degree called in question. I had endeavoured to show that mural decoration, of which fresco is a prominent, if not indeed the most approved method, possesses the elements of greatness and grandeur; that mural painting, by virtue of its allegiance to architecture, is almost of necessity symmetric in proportion and broad in the distribution of its distinctive members and masses. I further expressed the opinion, of which indeed there cannot be the shadow of a doubt, that at a moment when architecture is obtaining renewed and extended development—at a time when our buildings are passing from an era of whitewash to an epoch of colour, the whole question of mural decoration, whether by the process of fresco or otherwise, becomes of paramount import. It is a satisfaction to know that not one of these arguments, so far as they touched mural decoration in the abstract, were by a single speaker contravened. Fresco painting, as an individual process, it was objected, may possibly have proved imperfect. It may therefore be necessary to have resort to some other expedient. "But while" said the chairman, Lord Elcho, "we admit that *fresco puro* is imperfect in itself, let us not on that account give up mural decoration altogether—that is, high art on our walls—till we are assured that no good substitute has been discovered." Thus one important conclusion of this interesting and valuable debate is, that mural decoration of some sort England must have; that she cannot get on without it in one form or another. This is a valuable concession, proving the vital character of the topics which my paper had brought into debate, and showing how urgent it is that the conflicting merits of the rival processes shall receive through the Society of Arts, or from some other competent tribunal, speedy and final adjudication.

Among the several competing processes of fresco, tempera, encaustic, and water-glass, I had intentionally concentrated my attention on the first. It seemed to me that the method of fresco, which had received in times past encomium and honour, was at the present moment falling under unjust obloquy. Furthermore, the danger appeared to be imminent that, in the somewhat blind impulse of the moment, a plunge should be rashly made into the midst of methods which, however alluring at first sight, had certainly not as yet gained the advantage of long and tried experience. Such being the critical position in which the whole subject of mural decoration was placed, I deemed that good service might be done by bringing clearly and prominently into view the facts

which favour the fresco practice. In taking this course no aggressive attack was made upon what I have termed the rival processes. On the contrary, I emphatically stated "that the more the means can be multiplied whereby national and municipal buildings may be fittingly adorned, the better." And, in retracing the line then deliberately taken, I now fortunately find not one single opinion to retract or modify. The discussion which ensued I shall now attempt to pass in review.

In the first place as to the durability of fresco. The chairman, in his admirable speech at the close of the discussion, observed that "if he had been in Mr. Atkinson's position—arguing in favour of frescoes—he would not have pointed to the chromo-lithographs published by the Arundel Society, inasmuch as the object of that society was to preserve to after ages some feeble record of those great masterpieces of early Italian art, the originals of which were mouldering and fading away." I fear that this sentence casts, unintentionally no doubt, suspicion on the fidelity of the Arundel Society's publications. These chromo-lithographs are either faithful or false. If faithful, they are trustworthy testimony to the present condition of the Italian frescoes. Happily, I know, from personal scrutiny, that these prints are substantially literal; and, possessing this knowledge, I gave them in evidence to prove the durability of the mediæval originals. When I was last in Florence, Mr. Layard, who was then taking an autumn tour through Italy, showed me the drawings which Signor Mariannecci had just made of the frescoes by Masolino and Masaccio in the Brancacci Chapel. These copies professed to be accurate transcripts, taken direct from the frescoes themselves. Within a few days I revisited the chapel, saw the artist employed by the society at his labours, and am able to testify to the fidelity of his work. It was the chromo-lithographs reproduced from these very drawings to which I pointed in proof of the durability of Italian frescoes. These great historic works, I then stated, had been painted more than four hundred years, and yet, notwithstanding that the Carmine Church was destroyed by fire, this side chapel and its far-famed mural decorations stand intact. To this striking example many more might be added. It is true that frescoes exposed to the open air; that frescoes down the face of which the rain has trickled from broken roofs; that frescoes which have suffered actual outrage from soldiers or mobs of the people, are more or less in ruin. How, indeed, could it be otherwise? But, on the other hand, works which have received fair treatment remain almost in their original brilliancy, even to the marvel of all beholders. Therefore, with reason has the method of fresco been ever deemed in itself most enduring.

And in this place it may be well to say just one word by way of definition—fresco is a painting on a fresh, that is a wet, wall of mortar. Now, it was the practice of the middle-age painters to re-touch their fresco walls and works, when hard, by the secco, that is, the dry process; therefore, say certain English objectors, these pictures, when re-touched, are no longer frescoes. This conclusion is too severe. A picture originally laid down in fresco does not cease to be fresco when it receives a few dry touches. It is fresco still, and such it has been always deemed; therefore, all cavilling on this small point may be silenced. But out of this objection one satisfactory conclusion can be drawn. Of the two processes—fresco and secco—fresco, by common consent, is the most enduring. Therefore, if secco pictures, painted by Egyptians in their temples, and by Romans in the houses of Pompeii, have fairly held their ground. how much more stable would these works have proved if through the manipulation of fresco they had been embedded in the very structure of the wall. My reply, then, to these objections is, that if secco be good, fresco is still better.

That the restored process of fresco, as practised at Westminster, does not prove so lasting as the original method of the middle ages is our misfortune, and possibly our fault. The cause of the rapid decay of our pictures is still a mystery, chiefly, however, because we have not taken the trouble to inquire into the facts of the case. The process of fresco is simple; lime and sand are the only elements which go to make the mortar, and the pigments used in the actual picture should be limited to a few uncompounded earths and minerals. Yet the means, though thus simple, are apparently for us too difficult. Surely it ought to be humiliating to find that the comparative empiricism of the middle ages is of more practical worth than the vaunted science of our own times. But modern fresco, unfortunately, does not stand alone in frailty. Our artists have notoriously, in the matter of materials, committed the most melancholy blunders. Many of the oil paintings of Sir Joshua Reynolds are in ruin, and the landscapes of Turner, when touched by the cleaner, are in danger of falling to pieces. It surely then would be more becoming on our parts to plead want of knowledge and experience, rather than to presume to pass hostile judgment upon the noble art of fresco, which, in skilled hands, has won a victory over time and secured an immortality of fame.

Our English climate, our town smoke, and the chemical products of gas consumption, are usually adduced as reasons against the adoption of fresco in this country. These difficulties no doubt stand in the way of fresco, and so likewise do they prejudice every form of art reared in the land—architecture through its stone sculpture in its marble and bronze, oil and water-colour paintings in the paper and pigments. But however fatal these agencies may be in general—and I cannot but think that their destructive action has been greatly exaggerated—it is important to mark that they have little or no bearing on the facts now brought into discussion. The destruction of the frescoes in the Houses of Parliament has not been wrought so much by external as by internal causes. The atmosphere may not have been of the purest, and yet can it safely be asserted that the air which noble lords and honourable members have breathed with comparative impunity, has proved equally innoxious to the constitutions of the pictures. A close inspection of these works at any rate indicates, as I have said, internal rather than external agencies of destruction. Accordingly in the construction of the walls, in the constitution of the mortar, in the quality of the pigments, and in the mastery or otherwise of the manipulation, must we expect to find the real causes of premature decay; and such causes, be it observed, can scarcely be deemed irremediable in the inherent nature of things; rather are they amenable to inquiry and susceptible of removal. Moreover, as stated in my paper, though certain of our modern frescoes have perished, others have survived. Even in the Houses of Parliament some works and specific colours have stood firmly. Again, frescoes executed in other parts of the metropolis are unimpaired. The great mural painting in Lincoln's Inn, and smaller works in Little Holland House, all executed by Mr. Watts; also a fresco painted by Mr. Armitage, some years since, at Islington, are severally uninjured. Consequently the causes of destruction, whatf ever they may be, are partial and not universal, and i partial, then in some sense accidental; and if both accidental and partial, certainly not inherent in the constitution of fresco itself, but incident to the inability of modern practitioners. Architects, stonemasons, plasterers, colourmakers, and artists will probably have to share the censure between them. Again, the conclusion comes as inevitable—we may fairly blame ourselves, but not with justice fresco itself.

Having said thus much on the durability of fresco, I would now add a word on the inherent facility or difficulty of the execution. The statement that the plasterers of Mr. Dyce and Mr. Herbert died mad, as the result of the constant worry to which they were subjected, is, I believe, capable of another construction. The further assertion, that Mr. Herbert himself "had nearly been driven mad by the trouble and annoyance which the old

system of fresco caused him," is for the world a more serious matter. Still, against all such appeals to our sympathies, I may be permitted to say that as far as the experience of past times has come down to us, we have no reason to believe that any middle-age plasterer or painter, having the advantage of a sane mind to start with, was driven mad by the duties of his calling. Michael Angelo, we are told, shut himself up in the Sistine, and for months painted at the ceiling, lying on his back, and then came out, the greatest achievement of his life accomplished, and gloried in fresco as the grandest of arts. It is indeed astounding to observe with what unconscious simplicity our modern men, in their condemnation of fresco, furnish a scale whereby to measure their individual powers. But the artists of the middle ages were giants. There are still, however, a few painters among us who do not flinch from the arduous task which brings its commensurate recompense. Mr. Armitage, it is well known, is so enthusiastic a disciple of the fresco art, that he executed, at Islington, works at his own cost. Mr. Watts, fired by like ardour, painted a noble picture, without promise of reward, for the benchers of Lincoln's-inn, and both gentlemen would, I believe at the present moment gladly take a commission in fresco, without fear of the calamities which have visited the mural works at Westminster. In short, the difficulties vanish before experience. The Italian painters, we well know, were impeded by no discouragements, and their fresco achievements remain as the best monuments to their genius.

Lastly, a few lines must be devoted to the rival processes; and firstly, I will speak of the German method of water-glass. This is so completely a foreign invention, that the mixture "water glass," is imported in bottles, filled and corked in Berlin. Should this manufacture in the Prussian capital become, by any fatality, closed, our British artists, it may be feared, would be put to their wits end. Such a position is rather un-English, and has, certainly, not the recommendation of dignified independence. Comparatively little, indeed, is known of the process any way. Dr. Fuchs wrote a pamphlet, in Munich, nine years since, which is still a text-book to the method, yet since his time the manipulation, and probably the constituent elements of the new vehicle, have undergone modifications little less than radical. For example, at first the practice was to mix the paints in the water glass, but this "liquid flint" having clogged the brush, the "glass" or "flint" is now left out, and the decoction simply used as a lotion, whereby a fugitive tempera picture is sought to be permanently fixed upon the wall. Again, Dr. Hofmann, a prime authority in these matters, holds the opinion that the water glass, which is spread over the picture, should effloresce, as a proof of its efficacy. But, on the contrary, Mr. Maclise, the great practical exponent of the system, writes to Lord Elcho, that he himself prefers that this efflorescence should not take place! These diversities of opinion and practice are sufficient to show that this much-exalted method still rests in the dubious and vacillating region of experiment. Well, then, might Mr. C. H. Smith close his practical remarks by the decisive judgment "that the water glass process had not, as yet, been sufficiently tried to warrant its general adoption."

Then as to the question of the superior durability of water-glass, we are as yet living in its early days, and cannot possibly form any opinion which has the advantage of experience. When a century, or rather after four centuries, shall have passed away, our remote descendants may be able to determine which of the two methods—fresco or water-glass—is best fitted to withstand the ravages of time. Mr. Purdie, in the course of his eminently practical remarks, gave utterance to a sentence which certainly sounds as the doom of the recent invention. "The more impervious," said Mr. Purdie, "the surface of a picture was, the more liable was it to be affected by the damp from behind. The consequence was that the damp from behind carried away the surface of the picture." Now, in this ingenious method of water-glass, the fixity of the work actually depends upon making the surface of the picture impervious as by a varnish. The danger of varnishing an oil painting before it is thoroughly dry is known to every artist. The like, and, indeed, a tenfold greater peril, attends the hermetically sealed surface of the painted wall, which contains within its substance salts, fluids, and gases, which, if denied free escape, will make for themselves a road through violence. As to yet another rival process, termed, we may hope only facetiously, "spirit fresco," it surely is not necessary seriously to speak. The further, indeed, we pursue this question, the more evident does it become that in forsaking the ancient fresco, the arts are likely to fall the victims of a series of nostrums, each to be tried in turn, seductive at the first venture, but abortive in a dearly-bought experience.

Such being the sad perplexities to which the practice of mural painting is reduced, I deemed, as I have already said, that some service might be done by once again recounting the evidence which favours the art of time-honoured fresco. The grandest works which the world knows, such as Michael Angelo's ceiling of the Sistine, are imperishable in this process. The great artists whom history delights to honour—Masaccio, Ghirlandajo, Signorelli, Raphael, Annibale Carracci, and Domenichino, found this noble method a worthy instrument for the expression of lofty thought. Therefore I say, let us pause ere we condemn that which the voice of history has so loudly and unanimously approved. The final issue of the discussion now commenced, it were, perhaps, premature and presumptuous to anticipate. This, however, may with confidence be asserted, that to permit questions so grave as those here in debate to remain in their present absolute confusion, were on our part little less than culpable. In conclusion, it would surely, in the words of Lord Elcho, "be a pity that fresco-painting should be abandoned without a full and fair inquiry." "He would, therefore," continued his lordship, "enforce as far as he was able the suggestion that the Society of Arts should appoint a good, practical committee, in conjunction with the Institute of British Architects, the Royal Academy, and other bodies, who might go carefully into the subject." When such a committee or commission shall be constituted, the object which I had in view in bringing my views before your notice will be attained.—I am, &c., J. BEAVINGTON ATKINSON.

FRESCOES.—SIR,—I think it would be a good plan, where the frescoes are quite destroyed, to cut out the plaster a sufficient depth, and put up a sheet of plate-glass, the size of the panel, ground, but not polished, on the outer surface only. This would effectually prevent any damage from the wall itself, and then the design may be either executed in oil-painting, or tempera and silicate of potash. I am satisfied, from the way my walls effloresce, now after four years, that there is great danger from behind.—I am, &c., HENRY C. LACY.

M. VIAL'S PROCESS OF ENGRAVING.—SIR,—We think it due to Mons. Vial to correct a misapprehension which arose on the reading of his paper, owing to his neither understanding nor speaking our language. When asked how many impressions he had ever taken from one plate, he replied truly, 750, but had he properly understood the purport of the question, he would have added (as he afterwards informed us) that he had never had any occasion to print more, but the printer tells him that the plates will print many thousands, and that if submitted to the "acierage" process they would yield from 10,000 to 20,000 impressions. The reason why the plates experimented upon before the Society would not yield good impressions at once was, that in his anxiety to get the copper off the surface quickly, so as not to detain the Society longer than necessary, he employed some emery powder, which had the effect of filling up the lines, so

that they would not hold the ink. On the printer's cleaning out the lines next morning with a brush, the sketch was found to be faithfully engraved and the plate gave very fair proofs, some of which we have forwarded to you. With regard to the question as to the absence of lateral biting, we are perfectly willing to submit a plate to any member who will undertake to make a microscopic examination of the lines and communicate the result to the Society, as suggested by Mr. Wentworth Scott.—We are, &c., DAVIES & HUNT, English Agents of M. Vial.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, 8½. 1. Mr. Gifford Palgrave, "Journey through the Interior of Arabia, from Gaza to El Kathif, on the Persian Gulf, and thence to Oman." 2. Mr. George Clowes, jun., "Journey along the Western Shore of the Dead Sea, from Jebel-Usdum to Ain-Jidi."
Medical, 8½. Dr. Edward Smith, F.R.S., "The Evolution of Carbonic Acid by the Lungs and Skin, and other Phenomena of Expiration and Excretion, under the influence of various agencies."
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

TUES. ...Med. and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon Mr. Sopwith's paper, "On the Mont Cenis Tunnel."
Zoological, 9.
Ethnological, 8. 1. Rev. T. W. Farrar, "On Ethnological Traditions." 2. Mutee Cumara Swamy, "On the Ethnology of Ceylon."
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

WED. ...Society of Arts, 8. Dr. Marcet, F.R.S., "On Petroleum, its Economic Value, and a visit to the Petroleum Wells of Canada."
Geological, 8. 1. Mr. J. Wyatt, F.G.S., "On further Discoveries of Flint Implements and Fossil Mammalia near Bedford." 2. Mr. E. Ray Lankester, "On the Discovery of the Scales of *Pteraspis*, with some Remarks on the Cephalic Shield of that Fish." Communicated by Prof. T. H. Huxley. 3. Mr. G. E. Roberts, "On some Remains of *Bothriolepis* from the Upper Devonian Sandstones of Elgin." Communicated by Prof. J. Morris.
Archæological Assoc., 8½. 1. Mr. Cuming, "On a Seal of the Crewkerne Grammar School." 2. Mr. Wentworth, "On Heath Old Hall."

THURS. ...Royal, 8½.
Antiquaries, 8.
Philosophical Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

FRI.....Royal Inst., 8. Mr. J. Prestwich, F.R.S., "On the Quarternary Flint Implements of Abbeville, Amiens, Hoxne, &c., their Geological Position and History."

SAT. ...Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, February 12th.

GRANTS OF PROVISIONAL PROTECTION.

Animals, preparing food of—60—D. Pidgeon and W. Manwaring.
Armour-plates—265—H. Bessemer.
Belt clasps, bracelets, &c., fastenings for—273—J. O. Winkles.
Blinds, &c., raising or lowering—174—J. Sewell.
Belting mills—220—R. A. Brooman.
Bricks, &c., preparation of clay for—196—J. Platt and W. Richardson.
Casting, moulds, &c., for—190—D. Y. Stewart.
Cast iron, manufacture of articles from—153—N. McHaffie.
Charcoal, animal—283—E. Beanes.
Clasps, &c., belt—184—J. H. Brierley.
Clocks, application of magneto-electricity to—169—F. J. Ritchie.
Clothes hanging apparatus—289—A. J. Walker.
Coal, stone, &c., machinery used in getting—267—J. G. Jones.
Coal, stone, &c., machinery used in getting—158—G. E. Donisthorpe.
Coal, working of—90—C. Bartholomew.
Colours, manufacture of—200—E. Lucius.
Drama, &c., apparatus used in—41—J. H. Weston and C. Morton.
Fabrics, spinning—188—G. de Vanssay.
Fabrics, weaving cut pile—222—W. Norton.
Fire-arms, &c.—257—J. C. Haddan.
Fire-arms, breech loading—259—R. Brazier.
Fire-arms, breech loading—271—E. Harrison.
Furniture, securing to floors—172—F. W. Burton.
Gas, illuminating—281—G. Hammond and J. W. Kemp.
Gauges, pressure and vacuum—159—H. Brockhurst and J. Sullivan.
Glass, manufacture of—277—R. A. Brooman.
Hammer, atmospheric—206—W. D. Grimshaw.
Hats, &c.—210—M. S. McCallum.
Heating apparatus—263—W. Clark.
Hinges, hook—275—F. E. Martineau.
Hydraulic machines, cylinders of—269—W. N. Hutchinson.
Malt, corn, &c., kilns for drying—194—T. Bright.
Materials, machinery for hoisting—122—W. Balmforth and F. Robson.
Metals, &c., tools for cutting—287—F. W. Webb.
Nails, horse-shoe—232—F. Parkes.
Oil, &c., presses for the expression of—251—J. Marshall.
Organs—216—J. Stuttaford.
Organs, &c.—162—M. Henry.
Peat, &c., apparatus for treating—192—F. North.
Petroleum, &c., lantern and lamp for burning—164—J. T. Hall.
Projectiles—261—J. Whitworth.
Pumps, steam—198—W. E. Newton.
Railway engines, &c., wheels for—180—G. Smith, jun.
Railway waggons—239—J. Henson.
Rings for scarfs, &c.—178—R. E. Eades.
Sewing machines—168—J. H. Johnson.
Sewing machines—176—W. Clark.
Ship-building—224—P. Christie.
Shop fronts, protection for articles in—3239—H. Emanuel.
Spinning frames, &c., spindle bands used in—129—R. Newton.
Steam engines, regulating the speed of—214—W. E. Newton.
Steam engine, rotary—228—W. E. Gedge.
Steam vessels, paddle wheels for—189—T. Markland, T. Williams, and J. B. Sheridan.
Stays, manufacture of—166—C. Heptonstall and W. Lunn.
Straw, &c., manufacture of paper from—202—J. Piddington.
Sun blinds—140—G. Jenner.
Tables—212—S. Vaile.
Telegraphs, covering wire for—3151—J. A. Bailey and J. J. Speed.
Textile fabrics, pressing, &c.—73—J. Clegg, J. Clegg, and J. Rowley.
Tobacco, machinery for cutting—230—T. Butterworth.
Vessels, jib crane for loading, &c.—208—S. Moore.
Water, apparatus for raising, &c.—3162—V. De Stains.
Wines, spirits, &c., preservation of—249—B. I'A. Bromwich.
Wood, apparatus for cutting—149—J. Hamilton.
Zinc white, manufacture of—218—G. Darlington.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Paddle wheels, feathering—318—G. T. Bousfield.

PATENTS SEALED.

2014. M. H. Lishman.
2026. E. Lord.
2043. J. S. Crosland.
2048. H. Robinson.
2049. T. Dobb.
2051. J. Yates.
2053. R. A. Brooman.
2055. C. H. McCormick.
2137. W. Whitworth and J. Wrigley.
2139. A. Agnew.
2147. F. A. Braendlin.
2159. W. Clark.
2192. J. Rowell.
2233. M. A. Muir & J. McIlwham.
2330. H. Hutchinson.
2448. E. Jones.
2597. C. Fusnot.
2659. W. Firth, S. Firth, and J. Sturgeon.
2760. W. D. Allen.
2809. G. Haseltine.
2810. B. A. Murray.
3006. H. Wilde.
3113. A. Reid and G. Rydill.
3183. C. Humfrey.
3198. H. A. Bonneville.

From Commissioners of Patents Journal, February 16th.

PATENTS SEALED.

2036. J. Smith.
2042. T. Loftus.
2052. R. A. Brooman.
2058. C. Sonnhammer.
2070. J. Platt and W. Richardson.
2071. J. Platt and W. Richardson.
2073. C. D. Hammond.
2078. R. A. Brooman.
2079. W. Evans.
2081. E. Pope.
2082. J. B. C. Lange.
2084. R. A. Brooman.
2086. R. A. Brooman.
2090. W. Benson and P. W. Greenwood.
2100. G. E. Lewis, H. Walker, and J. B. Wayne.
2119. C. Richard.
2122. G. Davies.
2168. E. Collier.
2181. A. V. Newton.
2277. J. McEwen.
2047. W. E. Newton.
2798. F. Testuz.
2920. G. S. Kirkman.
3076. W. C. Page.
3100. W. L. and T. Winans.
3241. A. Turner.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

334. J. G. Jennings.
346. N. Thompson.
351. W. Oldfield.
384. G. J. Wainwright, C. T. Bradbury, & J. Lawton.
395. N. Nussey.
370. J. S. Blake, G. C. Lingham, and J. Nicklin.
486. J. Young.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

431. J. Lawson and S. Cotton.